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FEBRUARY, 1860.

CIVIL ENGINEERING.

Steam Engineering in 1859.* *Application of Steam as a Motive Power.*

(Continued from page 12.)

In the remarks on Steam Generation, when referring to the evaporative duty of 1 lb. of coal, the temperature of the feed water has been unintentionally omitted; and to prevent misconception, and give the said remarks the value due to them, it is only necessary to explain, that in all cases 100° is assumed as the feed temperature, for the reasons that this accords with the general working of condensing engines, and has been adopted by the Admiralty as the temperature of the feed in their experiments.

Before leaving this subject, it will be well to remember that the utmost saving which can be realized by supplying the boilers with water having a temperature of 212° instead of the usual temperature of 100°, does not exceed 10½ per cent.; many disappointments would be spared if this fact was more generally known and respected.

It may also be explained, that fully admitting an increase of the total heat in steam as it increases in pressure, yet, for the sake of simplicity, all the evaporative statements and comparisons have been made at an assumed atmospheric pressure. In general practice, excluding locomotives, the working pressures on land and sea may be included within 15 lbs. and 45 lbs. per square inch (above the atmosphere), and the additional total heat in steam of 45 lbs. per square inch as compared with that of 10 lbs. is, according to the best authorities, about 7·4°; this is equivalent to a loss of evaporative duty in generating the higher pressure of scarcely ¾ per cent., and this loss will be increased slightly by the increased radiation.

* From the Lond. Artizan, Aug. 1859.

In the case of the locomotive, with say a pressure of 150 lbs. per sq. inch, the total heat is about 33° in excess of that of 15 lbs. making a difference in evaporative duty of scarcely 3 per cent. in favor of the latter. It is quite evident, therefore, in comparing evaporative duties under moderate and usual pressures, it is for general purposes unnecessary to notice the difference arising from the varying total heat in steam of different pressures.

After considering the present state of steam generation as regards evaporative duty and economy, it is necessary before passing from the boiler to the engine, to ascertain in what condition steam is supplied and conveyed from the generator to the cylinder.

In land boilers, where space can easily be obtained, steam capacity sufficient to prevent priming is readily insured; but at sea it is often most difficult in a multitubular boiler to supply steam without an undue amount of water in combination with it.

Among the main causes of priming, are contracted water surface, irregular local evaporation, insufficient steam space, and position of steam exit. The first prevails chiefly in cylindrical tubular boilers; the second more or less in all multitubular boilers; whilst the third and fourth may be found in all kinds of boilers.

Unless positive inconvenience arises, the presence of an undue amount of water with the steam is not readily ascertained. Violent action in the gauge-glass, water in the cylinders, and sometimes loss of vacuum, are almost the only signs of priming; but there can be no doubt, all these symptoms may be wanting, and yet the steam supplied be accompanied with an excess of moisture.

Without superheating the steam (which will be referred to in due course), it is essential in avoiding any unnecessary loss of heat to supply it with the moisture due only to its pressure and sensible temperature.

Unfortunately, there is no reliable information on which to determine the amount of heating surface required in the steam space; but it must be evident it should be more or less, according to capacity, area of water surface, and all those other conditions determining the priming or non-priming qualities of a boiler.

The supply of pure steam is a great desideratum, though seldom obtained; little or no anxiety is expressed on the subject, except in extreme cases, when the palpable inconveniences before referred to compel the engineer to supply a remedy.

And now a word respecting the transit of the steam from the boiler to the engine.

On land, as a general rule, there is a considerable length of steam piping between the boiler and the engine; frequently this piping is unclothed, and even when clothed the condensation therein is considerable.

In a Cornish mine, steam power was required under such circumstances, that an unusually long steam pipe was necessary: this pipe was unclothed. The day arrived for setting the engine to work, but it was found impossible to supply sufficient steam to drive the engine alone.

The boiler was of the usual description and size for the power; and the failure could not at first be accounted for, but on disconnecting the steam pipe from the engine, it was found that the condensation of the steam in transit was sufficient to abstract ¾ of the heat in the steam; as a remedy, the steam pipe was enclosed in a flue, kept at a temperature equal to the sensible temperature of the steam; the result was in every way satisfactory, there being a pressure of 40 lbs. in the boiler and 37 lbs. in the cylinder.

This is an extreme case; but the bulk of factory engines lose a large per centage of their power by similar condensation, which mere felt and canvass or wood will reduce, but not prevent. In marine engines, with thin copper piping (generally placed under the hatchway, supplying the cold air to the boiler furnaces), the temperature of the felt and canvass covering indicates plainly the combat going on between 250° inside, and 70° outside. The result is an addition to that condensation, the presence of which every engineer must deplore; and the cylinders are supplied with steam of a different and less valuable character than that generated.

One reason why this, to a great extent useless, condensation exists is ignorance of its exact amount, and often also of its effect in the cylinder, to which we shall refer anon. What would be said of the engineer who supplied his furnace with a constant stream of cold water, or who arranged a shower-bath on the top of the boiler? and yet to produce the effect of such arrangement is the daily orthodox practice of the steam engineer. He readily recognises the difficulty of absorbing the latent heat, and producing a cubic inch of water from steam in the condenser; whilst, at the same time he is often practically indifferent to the formation of water in the steam-pipe.

Time and experience will undoubtedly show the importance of conserving to the utmost the heat of the steam in transit from the boiler to the engine; and where circumstances require an exposure of the steam-pipe, it will be found that, to avoid a loss more than due to condensation *per se*, it is necessary, by some means, to preserve the working steam at its full temperature and pressure, and arrange that whatever loss of heat and condensation are unavoidable should take place apart from the working steam, in maintaining its temperature and pressure.

Are engineers and users of steam-power alive to the importance of supplying steam engines with uncondensed elastic steam? We think not, or so many unclothed steam-pipes and cylinders would not be found in use, the former frequently inclined towards the cylinders, so that all the water resulting from condensation is obliged to pass through the engine to the condenser.

Since steam was first employed as a motive power, there has been a constant yearning among engineers for a simple engine, having few moving parts, and those comparatively frictionless; hence the various schemes for rotary, oscillating, and other simple engines; and we have the result of these efforts in the almost perfect specimens of mechanism now produced by our first engineers of the present day.

If a knowledge of, and attention to, the science of steam-power had kept pace with the progress and improvement in the mechanism for producing and applying the same, steam engineering in 1859 would not be in such a defective state, nor would there be such a serious difference between the actual and possible results.

All steam engines may be divided into two classes—beam or lever, and direct-acting; and in every kind of steam engine there are two distinctive arrangements affecting the duty realized: the first is the conveyance, use, and disposal of the steam, and, secondly, the mechanism by which the steam pressure is transmitted to the resistance to be overcome.

The pressure and power of the steam being entirely dependent upon its temperature, it follows that the first point to be insured is the preservation of this temperature.

Boiler supplies Cylinder with a certain amount of steam, containing so many units of heat available for power; what does Cylinder get out of this steam? Why, in the first place the reception is most chilling, steam parting with much of its heat in warming Cylinder. Generous Boiler makes good the deficiency, until the door is closed, say at $\frac{1}{4}$ of the stroke, when, $\frac{1}{4}$ only of Cylinder being warmed, the remaining $\frac{3}{4}$ robs the expanding steam, now cut off from Boiler, of a further amount of heat. Cylinder having now got all it can out of steam No. 1, opens the back door, and begs it to make itself scarce, and walk into the condenser, so as not to impede the entrance from boiler of steam No. 2, on the other side of the piston. Directly the water accompanying the exit steam breathes a vacuous atmosphere it begins to evaporate, robbing Cylinder of nearly the whole of its ill-gotten heat derived from steam No. 1; and, not satisfied with this, insists on injection converting it, for the *second* time, into water. These unfriendly acts prevent steam No. 2 from deriving the advantage it had a right to expect from heat supplied to Cylinder by steam No. 1.—*Nolens volens*, steam No. 2 has to re-warm Cylinder, receive the extra supply during admission from boiler until the door closes, and then continues the heat-losing process until, like No. 1, it arrives at the end of the stroke in a most reduced condition, and, as the back door opens, rushes, with its companion water, into the condenser, to give further trouble to injection and pumps. After working thus for some time, Cylinder stops, and Boiler begs leave to have the accounts looked into. Such a reasonable request cannot be refused; but after considerable discussion, no balance can be made. Boiler says to Cylinder, "I supplied you with 1000 cubic feet of steam, which, if rightly employed, should give a duty according to the heat therein, whereas the duty realized is not equivalent to an expenditure of 700 cubic feet; what have you done with the missing 300 ft.?" Cylinder then confesses, with tears (condensed steam), that somehow or other it had borrowed a little heat from steam No. 1 to warm itself, and, at the end of the first stroke, felt quite comfortable, and was in a position to return to steam No. 2 the borrowed heat; but directly the back door was opened, the water left with the steam, as the result of the heat abstracted by the Cylin-

der evaporated, and took in to the condenser nearly all the heat that the Cylinder had borrowed from the steam.

After this confession, Boiler proposed one remedy, and Cylinder another; the former said to Cylinder, "I have more heat in my flues than I require (awkward confession), and will give such an extra supply to the steam I furnish you with, that after you have appropriated as much as you require to keep yourself hot, there will be sufficient left to prevent any condensation."

This remedy was tried, and the result was that on all occasions no difficulty was experienced in making a balance. It is but fair, however, to state that Cylinder (this time without tears and with a dry skin) was overheard to remark, that, "since Boiler's remedy had been in force, it was too much of a good thing," and "he had now more heat than he wanted," and "that he couldn't stand it long without losing flesh."

Cylinder's remedy was to keep itself supplied with, and constantly wear a hot jacket, sufficient to keep him at a constant temperature, and prevent stomachic condensation, and after trying this plan Cylinder seemed quite comfortable, and soon saved the cost of the hot jacket.

The above, omitting the remedies, fairly represents the state of affairs in all condensing engines, and is another straw, and rather a large one, on the camel's back.

Water boils in a pure vacuum at a temperature little in excess of that of the atmosphere of an engine room—so that whatever condensation takes place on the admission of the steam to the cylinder, the water resulting therefrom, is invariably of such a temperature, as to be converted into vapor when brought into communication with the condenser; thus this steam is twice generated and twice condensed.

Nor is this diseased condition confined to condensing engines, but exists to a considerable extent even in the locomotive, except when the cylinders are maintained at a temperature equal to that of the working steam by being placed in the smoke-box or flue.

In a Paper read before the Members of the Institution of Mechanical Engineers, by Mr. D. K. Clark, in 1852, it was shown that in engines with outside cylinders, the condensation therein amounted to 20 per cent. of the total steam used, when it was cut off at one-third, or expanded twice. The greater the expansion the greater the per centage of condensation.

In all cases with clothed or unclothed cylinders, when circumstances have admitted of a comparison between the amount of water evaporated and of steam used, a considerable loss by condensation in the steam pipes and cylinder has been detected, in some cases to an extent of 40 per cent.

Again, it has been found that 1 lb. of coal expended in heating the cylinder is equivalent in effect to five pounds of coal burnt in the furnace of the boiler.

Again, the amount of heat required to keep the cylinder at the temperature of the working steam, has never been found to exceed 10 per cent. of the total heat expended, and in many cases has been less than 5 per cent., whilst with an expansion of four or five times, the jacket

expenditure of 5 per cent. realizes an increased duty of not less than 25 per cent.

Again, the injection and air-pumps can be reduced fully one-fourth, when means are adopted to prevent condensation in the cylinders.

It may be added also that the evil effects of water in the cylinders at starting are never experienced, when the cylinders are properly heated.

Watt patented the heated jacket in 1769, and in 1859 not one per cent. of the engines in use, have any arrangements for maintaining the temperature of the working steam, engineers being practically indifferent to the waste such neglect occasions.

Can one heated cylinder be found in her Majesty's steamships of war? if not, will the great men who supply our marine engines to the steam navy, condescend to inform the engineering public why, with their extensive connexion and influence, they are, in 1859, so silent on this important subject? will they not have compassion on us, and prove that they are right in ignoring the maintenance of heat in working steam?

Will the designers of the machinery of the *Great Eastern* explain why a trifle of £2000 or £3000 was not expended in ascertaining the truth or fallacy of the alleged economy of such a simple improvement as heating the cylinders?

The remarks on expansion, &c., must be left to the next number.

(To be Continued.)

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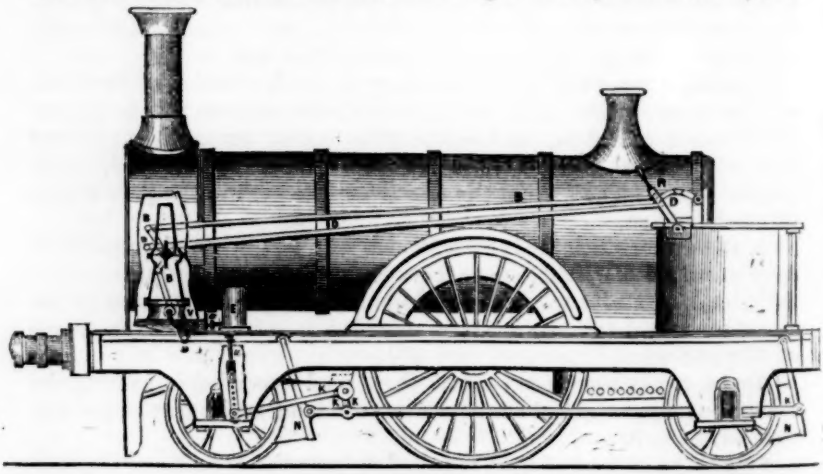
*An Improved Method of Retarding and Stopping Railway Trains.**

By Alexander Allen, Engineer, Perth.

In the prevention of collisions, and their consequently serious results, a few seconds are most valuable: the danger also is, in most cases, first



seen by the man in charge of the engine. The object of these improvements is, therefore, to give the driver increased power of controlling

* From the Lond. Mechanics' Magazine, November, 1859.

the speed of, and in stopping the trains; and for this purpose, and in order that the whole brake power of any train may be brought into requisition in the shortest possible time, it is recommended that, in addition to the apparatus to be hereinafter described, a cord shall be placed within convenient reach of the men on the engine, communicating with a bell fitted up in the first brake-van, by which means the guard may be apprized of his assistance being required at the van-brakes.

The improvements consist of two distinct parts. 1st. By inserting a throttle or other valve in the exhaust-pipe of the engine at A, so that by means of a connexion B the driver can fully or partially close the valve A. By the table of experiments appended, it will be seen, that by the closing of this valve (the regulator being at the same time open), a retarding force is opposed to the engine of equal power with the tender brakes, and for all *ordinary* stoppages this can be used to bring the train almost to a dead stand—the tender brake being applied only for say the last dozen yards, thus effecting a great saving in the permanent way, tender-tyres, and brake-blocks.

The second part of the improvements consists of a steam brake to work in connexion with the above valve in cases of great danger. The steam is taken from the exhaust-pipe by means of the pipe C, which is supplied by a stop-cock or valve V, worked from the foot-plate by the connexion D, which being separated from the connexion B, it will be seen that one or both of the retarding forces may be used at pleasure. The steam from the pipe C passes to cylinder E, actuating the piston H and levers K, &c., and brake-blocks N, which may be applied to all the wheels if desired, but by preference they are shown attached to the leading and trailing wheels only of passenger engines. On the steam being released, the weight of piston, rods, and levers will free the brake-blocks from the wheels.

By partly closing (more or less) the throttle-valve, trains may be controlled when passing down steep inclines to any desired speed, leaving in reserve (in the case of heavy goods trains especially) a great surplus of brake-power to bring the train to a stand quickly on any incline—namely, that of the steam-brake herein described, and also that of the tender and van-brakes. In illustration of this, an experiment, not included in the table, resulted as follows:—On an incline of five miles, the gradients averaging 1 in 80 (descending), and with a gross load, estimated at 200 to 210 tons, the throttle-valve alone controlled the train from a starting speed of thirty miles per hour to fifteen miles per hour over the whole distance.

The partial closing of the valve may also be made to prevent violent slipping, as the wheels will only revolve in proportion (*i. e.*, the traction will only be equivalent) to the quantity of steam allowed to escape from the exhaust-pipe, and this may be regulated to any extent by the valve, which can be worked with greater ease and nicety than the regulator.

With regard to reversal, it is known to be extremely difficult, if not impossible, to reverse an engine at speed, but it will be seen that, with

full steam on the pistons, the closing of the throttle-valve, which is not effected by speed, produces a result quite equal to that of reversal, whilst reversal itself is facilitated by a greater equalization of the pressure on both sides of the valves, and an increased brake-power is obtained (see Table) without the usual objectionable results of reversing the engine whilst in motion.

The combined effect of these appliances may further be shortly stated to be,—

1st. By the throttle-valve alone a power is exerted equal to that of the tender-brakes.

2d. By use of the tender-brakes in combination with the above, a doubling of this power is obtained.

3d. By using the engine's steam brake-blocks, the throttle-valve, and the tender-brakes together, a retarding power equal to triple that of the tender-brakes alone is brought out.

4th. In addition to the above, by reversing, this retarding power is still further increased, and

5th. By the recommended communication from the engine to the van, used in combination with the whole, a power of stoppage is obtained, which has not hitherto been equalled, and within much less time. This last is the most important element, as all necessary manipulations can be gone through in one or two seconds after their requirement being noticed.

TABLE.

Abstract of experiments with a gross load of 85 tons, made up as under:—

Engine, . . .	18 tons.	85 tons.	Weather calm; rails dry.
Tender, . . .	12 "		
Eleven empty carriages, .	55 "		

Gradients.—The first ¼ mile from the post at which the brake-power was applied was level. The next ¼ mile further, 1-500ths rising gradient. In every case, the retarding force was applied at the same mile-post on the same line of rails. The carriage-brakes were not applied in any case.

Number.	Seconds to ¼ mile.	Miles per hour.	Seconds to stop in.	Distance run, yards.	Class of Brake, and Remarks.
1	25	36	156	1432	No brakes applied.
2	25	36	80	800	Throttle-valve only used. Valve leaky did not bring the train to a *dead stand*. Speed was very slow for the last ⅛th of a mile.
3	25	36	66	715	Tender brake only.
4	24	36½	63	710	Throttle valve closed, and engine reversed.
5	25	36	50	460	Throttle valve closed, engine reversed, and tender brake used
6	25	36	55	450	Throttle valve closed, and tender brake used.
7	25	36	50	400	Throttle valve closed, and engine steam brake applied.
8	25	36	30	275	Throttle valve closed; engine steam brake and tender brake applied.
9	25	36	23	220	Throttle valve closed; engine reversed, steam brake and tender brake used.

NOTE.—The results as per table were obtained from an engine with the throttle valve and steam brake fitted up only in a temporary manner. With the apparatus more perfectly applied better results would necessarily be obtained.

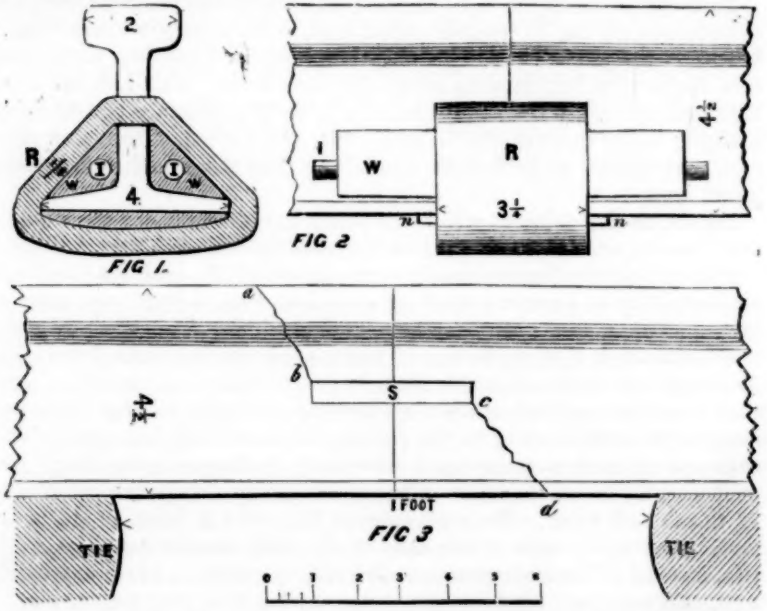
For the Journal of the Franklin Institute.

Description of a Triangular Ring-joint used on the Camden and Amboy Railroad. By JOHN C. TRAUTWINE, Civ. Eng., Philada.

To the Editor of the Journal of the Franklin Institute.

The accompanying sketch represents a triangular ring-joint, which has been in successful use for seven or eight years on portions of the Camden and Amboy Railroad between Philadelphia and New York. A recent examination of some of these joints, which have been, for about three years, traversed daily by from 20 to 30 freight and passenger trains drawn by heavy engines, has so fully convinced me of their merits as to induce me to submit to you a brief description of them. It is probable that this joint may furnish hints for further improvements, and, perhaps, lead to something superior to any of the joints and chairs now in use. It was devised by Edwin A. Stevens, Esq., who was for many years superintendent, and is now president of the road.

The *circular* ring-joint, which was made on essentially the same general principle, was found liable to the objection of *revolving* under the action of the trains, and thus greatly expediting the loosening of the wooden wedges by which it was confined to the rail. This difficulty is obviated in the present joint, which is fully shown in the accompany-



ing sketch drawn to one-fourth its real size. Its construction is very simple, consisting merely of a continuous nearly triangular ring or sleeve, R, of wrought iron, Figs. 1 and 2, 3¼ inches wide, and ½ inch thick. The top of this ring passes through a slot, S, Fig. 3, cut out

of the ends of the rails; and, after being fixed in its position, two cast iron wedges, w w, Figs. 1 and 2, 7½ inches long, and with a very slight taper, are driven between the sides of the ring and those of the rail. These wedges being liable to break are strengthened by rods of wrought iron ⅜ of an inch in diameter, and 8½ inches long, inserted as a core when the wedges are cast. A thin wedge of plate iron is also driven in, under the rail.

The joints are placed, not *over* but *between* the cross-ties; the distance apart of which is there diminished to about one foot in the clear, Fig. 3.

This is not only the most simple and cheapest joint that I have seen, but, so far as I can judge from that portion of the road which I have examined carefully, one of the most effective. As before remarked, the ring-joint on that portion has for about three years sustained the traffic of about 25 trains daily, drawn by heavy engines; yet the joints are in so perfect a condition, and the ends of the rails so free from bruises and splits, that I at first thought they had been laid but a few days. The weight of the rails is about 65 lbs. to a yard; and I observed that where the same rail had been laid for the same length of time, and had endured the same traffic, but with very heavy cast iron joint chairs resting on the cross-ties (instead of the ring-joint), the ends of the rails were bruised, and the joints comparatively uneven.

In close proximity to the foregoing and under the same general circumstances, is the 91 pound rolled rail, with strong wooden fishing beams at the joints (similar to what is known as Trimble's joint), and also devised by Mr. Stevens about 15 years since. This rail has worn much more rapidly than the smaller one, and its ends are considerably bruised; while those of the 65 pound rail laid with the triangular ring-joint, are almost as perfect as on the day they were laid, about three years ago.

Again, at the point at which the foregoing observations were made, the Camden and Atlantic Railroad crosses the Camden and Amboy.

The rail of the former road is the inverted ∩; and its joints are connected by an inverted ⊥ chair of rolled iron, 5 feet long, with 4¾ inches width of base; the base being ½ inch thick. This chair rests on three cross-ties, the middle one of which supports the ends of the rails. Although the traffic over this chair is very trifling in comparison with that over the ring-joint of the Camden and Amboy road, yet it has sufficed to show that owing to the rigidity of the former the ends of the rails are exposed to more rapid deterioration than with the ring: it is probable, however, that the difference is partly due to the inferiority of the ∩ rail itself. I am of opinion that the ⊥ joint would prove much more serviceable if the ends of the rails met *between two* cross-ties, instead of resting *upon one*. It holds the rails in place extremely well, and certainly possesses much merit; but it is very expensive.

The triangular ring-joint is not free from defects. Its wedges loosen and require frequent re-driving, as is always the case where such wedges are used with rail chairs. This, however, is a consideration of but little importance; and the track men find this joint to require much less

attention than chairs with wedges. A more serious one is, that where the foundation on which the cross-ties rest is bad, and permits much unequal settlement, the increased strain thereby brought upon the ends of the rails and upon the ring-joints, occasions a tendency to split off a portion of the end of the rail either above or below the slot, as shown by the lines *a b* and *c d*, Fig. 3. Very nearly all break *below*, along *c d*.

This can be avoided only by careful attention to maintain the constant adjustment of the track. It has taken place to but a limited extent on the Camden and Amboy road, and fortunately is not attended by any danger to trains. The taking up of a rail and replacing it by another, with the ring-joint, is an operation of no more than the ordinary labor involved in the process of changing rails. The engines and trains pass over the joint very smoothly, without any perceptible jar or noise.

The rings are formed on a mandril of the required shape.

For some of the foregoing facts I am indebted to the kindness of Col. William Cook, Chief Engineer of the Camden and Amboy Railroad; and it affords me pleasure to add that he fully concurs with me in considering the triangular ring as being the best of the many joint fastenings and chairs that have been so thoroughly tested on that important work. He is extending its use upon the road, as fast as the necessity for laying new rails permits him to do so.

With some simple device for preventing the loosening of the wedges, and the breaking of the rails, this joint would leave little to be desired. Perhaps the former might be attained by using *wrought* iron for the side wedges w w; the smaller ends of which might be suddenly tapered off, so as to be readily bent outwards a little, after being driven, and the latter, by the use of longer and stouter bottom wedges.

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*Straightening a Chimney Stack.**

The operations for restoring the colossal chimney at Port Dundas to a perpendicular and safe position, are now successfully completed. This was accomplished by sawing several of the mortar beds between the courses on the side from which the chimney leaned, thereby allowing it to come back by its own weight, without the application of any external force. Only one draft was cut at a time, to guard against any shock which might have endangered the stability of the building, and by keeping the saws wet, a bed of mortar was prepared for the superincumbent weight to settle down upon. Twelve cuts were made in this manner, on different parts of the structure, which generally set before the saws had passed through half of the circumference, particularly in those made nearest the ground where the weight was greatest. This method, which has been attended with complete success, was adopted by the advice of Mr. Duncan Macfarlane, architect. The principal dimensions of the chimney are:—Total height, 468 feet; from surface to top of cope, 454 feet; outside diameter at foundation, 50 feet; at surface, 34 feet; at cope, 14 feet.

* From the London Civ. Eng. and Arch. Jour., Nov., 1859.

AMERICAN PATENTS.

List of American Patents which issued from November 1, to November 29, 1859, (inclusive,) with Exemplifications.

NOVEMBER 1.

1. Cut-off Valves for Steam Engines; E. R. Arnold, Providence, Rhode Island.

Claim—1st, Making the tappet and the ends of the jointed valve rods, inclined in a direction at right angles to their lines of motion, and combining them as set forth. 2d, The combination of the regulator with a tappet, constructed as described.

2. Shirts; L. S. Ballou, Jr., City of New York.

Claim—A shirt, formed by having its yoke made of two pointed projections, extending down from the shoulders or inclined front ends of the yoke, on the shoulder blades of the wearer, in such a manner as to leave a recess between the projections, which recess extends upward nearly to the neckband.

3. Railroad Car Couplings; H. A. Barnes, Milwaukie, Wisconsin.

Claim—The arrangement of the latch in the draw-head, in combination with the cam, latch, or hook connexion, lever, or treadle, in the manner described.

4. Method of Protecting Telegraphic Instruments against Atmospheric Electricity; E. F. Barnes, Brooklyn, New York.

Claim—The application and use in a telegraphic line, or in connexion with telegraphic instruments, of a vessel, containing acidulated water or fluid, and having a platinum or other metallic wire of better conductibility than the contents of such vessel passing through such vessel, and connecting by one end with the main wire, and by the other with the telegraphic machine. Also, in combination or connexion with such vessel of fluid and wire, the arrangement of the metallic points on the wire of the main line, and extending into the fluid.

5. Machines for Packing Flour in Barrels; J. Bartholomew, Union, New York.

Claim—1st, The combination with the packing screw, or its equivalent, of a cylinder, or its equivalent, so that the flour will be first packed within the said cylinder, or its equivalent, and then discharged therefrom, in a packed state into a bag, barrel, or other receptacle. 2d, The arrangement of the rod, levers, Q K, block, connected with the shaft by the cord or chain, and the hub or boss on screw-shaft, for the purpose of automatically discharging the packed flour from the cylinder or measure. 3d, The arrangement of the lever, D, with pinion, attached block, hub, or boss, levers, O F, and spring, for the purpose of automatically discharging the pinion from the wheel, and thereby stopping the rotation of the screw at the proper time.

6. Coffee-roaster; R. L. Bate and James Caulkins, Adrian, Michigan.

Claim—The combination of the stationary cylindrical chamber, revolving skeleton stirrer, and outer vertical cylindrical casing, constructed as set forth.

7. Rails for Railroads; G. W. R. Bayley, Brashear, Louisiana.

Claim—The reversible Z rail for railways, that is to say, the rail with its stem placed inside of the vertical centre of its head, outside of the vertical centre of its base, with the inner and outer portions of its head and of its base of different thickness and form, with its head and its base similar in transverse section as to outline, though reversed as to relative position and connexion to the rail stem; the stem being nearest to the inside thick lip of the rail head, and to the outside thick lip of the rail base, while the thin lip of the rail base is inside, and the thin lip of the rail head is outside.

8. Cotton Gins; Benjamin G. Beadle, Memphis, Tennessee.

Claim—Uniting the knuckles or projections on the ribs, by a back or brace extending through the series for the purpose of strength, and for keeping them in proper position.

9. Farm Fence; T. G. Beecher, Beaver Dam, New York.

Claim—Combining with the posts, arranged as described, the rails made removable and replaceable by means of the locking device.

10. Arrangement of Devices in Shingle Machines; W. H. Bitzer, Muscatine, Iowa.

Claim—The arrangement of the frame and planer upon the self-adjusting swinging bar, and the combination of the parts thus arranged with the pivoted lever and reciprocating carriage, as described.

11. Sewing Machines; Wm. G. Budlong, Hartford, Connecticut.

Claim—The combination of the adjustable groove segment with the looper bar fitted loosely therein, feeder arrangement, operating rod, having cams secured thereto, and connected by arms, arranged in the manner described.

12. Scale for Cutting Boots and Shoes; S. F. Burdett, Keokuk, Iowa, and Henry Still, Leavenworth City, Kansas Territory.

Claim—1st, The lines of average ankle, heel, instep, and ball measures, running from the point "A," or any other given point that will produce the same result, with the lines of increase and decrease intersecting them at such an angle, and at such a distance from each other as will produce the purpose set forth. 2d, The device of so arranging the heel and instep measures, that any required size of said heel and instep may be marked at one stroke with or without the combination of the average measures of the same. 3d, The one-third of an inch increase and decrease of average heel measures upon the different lengths of lasts, or such portions of an inch as will produce the same effect.

13. Water-metres; Levi Burnell, Milwaukie, Wisconsin.

Claim—The arrangement of the hollow arbor with a narrow slot, in combination with the lips formed by the inner edges of the buckets.

[This invention relates to that class of water-metres in which a bucket wheel is employed, which is caused to rotate by the gravity of the water as it enters one of the buckets after the other. The water enters the buckets through a narrow slot in the arbor around which the bucket wheel rotates, and the inner edges of

the buckets form lips which cut off the water from each bucket as soon as the same is filled, and cause the stream to pass into the next succeeding bucket. Each bucket is caused to fill to the exact height by means of a counterpoise, whereby the water is measured correctly and also weighed at the same time.]

14. WASHING MACHINE; Robert H. Champlin, East Greenwich, Rhode Island.

Claim—The combination of the rounds or slats and springs with the cylinder, constructed as described

15. ELECTRO-MAGNETIC BURGLARS' ALARM; Edward C. Clay, Malden, Massachusetts.

Claim—The combination in an electric burglars' alarm of a galvanometer, with a resistance coil and an automatic switch, for the purpose of indicating the point where a burglar is attempting to effect an entrance. Also, the combination in an electric burglars' alarm of a galvanometer and a bell, with suitable mechanism to ring it, for the purpose of simultaneously giving an alarm and of indicating the place of attack. Also, the use in a burglar alarm of a regulating coil, in combination with the resistance coils, for the purpose of maintaining a constant relation between the strength of the current and the varying resistance of the circuit, when the respective resistance coils are included.

16. PROJECTILES FOR ORDNANCE; J. W. Cochran, City of New York.

Claim—Constructing and combining the body of the projectile and its shirt or case of soft metal, so that the passages for the gases of the exploded powder are formed partly in the body of the projectile, and partly in the shirt or case, with their entrances in the shirt or case, without perforating the body of the projectile; and that the shirt can be carried separately from the body and slipped on when required for use, in such manner as to remain secured thereon during the flight of the projectile.

17. SLIDE VALVES OF STEAM ENGINES; Nathan Cope, Cincinnati, Ohio.

Claim—The combination with the valves of the grooves and notches, as set forth.

18. ELECTROTYPE PRINTING-BLOCKS; Thomas Crossley, Rockville, Connecticut.

Claim—An electrotype printing-block for printing fibrous and textile fabrics, which is prepared from a mould formed of at least three different lengths of type, so as to have a highly raised printing-face, composed of metal margins surrounding a felt or other equivalent ductile or plastic substance, to lift or carry the color.

19. MEAT-SLICER; Bradford Dean, Clayville, New York.

Claim—The arrangement of the knives, I and I', knives, D and D', and the adjustable guide, as described.

20. STEAM ENGINES; James Cumming, Boston, Massachusetts.

Claim—1st, The combination with a square piston chamber, of a square piston, which is constructed of a series of angular sections of packing, joined loosely together by lap joints, and made adjustable and kept steam-tight. 2d, In combination with the above, the use of a square piston rod and a square stuffing-box, in the manner set forth.

21. STAVE-JOINTING MACHINE; John K. Derby, Jamestown, New York.

Claim—1st, The employment of two conical cutter heads provided with suitable knives connected by teeth, or other means, so as to insure a simultaneous rotation, and placed on frames connected by hinges or joints. 2d, The attaching of the knives to the cutter heads in reverse positions, so that they will cut from the centres of the staves outwards.

22. METHOD OF MAKING A HARD COMPOUND OF RUBBER; George Dieffenbach, City of New York.

Claim—The application of artificial heat to a composition of matter, consisting of sulphate of alumina, and other ingredients, for the purpose of curing and hardening the said composition.

23. HANGING CARRIAGE BODIES; William Doulin, Youngstown, Ohio.

Claim—In combination with any of the ordinary springs of a carriage, an elliptic spring on the reach of the wagon, said elliptic spring being constructed and arranged in the manner set forth.

24. LOCKS; C. Duckworth, Hartford, Connecticut.

Claim—The tumbler and slotted arm attached to the bolt, lever, or its equivalent, and the key provided with lever, combined and arranged as set forth.

25. HARVESTERS; J. A. Dufield, McHenry, Illinois.

Claim—Wheels, a a, provided with pins, and diamond-shaped, in combination with cutter bar, shaft, wheel, D, and lever, arranged in relation to each other as described.

26. FLY-TRAP; Aaron Eames, Kalamazoo, Michigan.

Claim—The combination of the fly receptacle, register, rotating clearer, bait-board, and gate, arranged as set forth.

27. PLATFORM SCALES FOR RAILROADS, &c.; Thaddeus Fairbanks, St. Johnsbury, Vermont.

Claim—The arrangement of the supporting standards and the loops or supports of the longitudinal levers and platform, with respect to each other, and so as to extend within or into the space between the side timbers of the platform, as specified.

28. SEWING MACHINES; Wm. A. Foster and Elliott Savage, Meriden, Connecticut.

Claim—1st, The presser-foot, in combination with the spring and with the needle stock, so arranged that by the operation of the latter, the force of the spring will be taken from the presser-foot at the time the feed of the cloth is to be given, that is, when the needle is out of the cloth, but without raising the said presser-foot from the cloth, in the manner described. 2d, The needle-guard, constructed and operating as set forth, in combination with the needle and with the thread-carrier or looper. 3d, So combining and arranging the double-jointed stock of the thread-carrier with the two levers, as that the said parts shall vibrate in the same plane, and also that the said stock shall form a link between the two levers, which are operated to have their arcs of vibration opposed to each other, whereby, with the least throw of the said levers, the greatest vibration of the thread-carrier is produced.

29. MILLS FOR CRUSHING AND PULVERIZING QUARTZ, &c.; James P. Gage, City of New York.

Claim—1st, The combination of cast-rolls upon wrought iron shafts (the rolls cast solid upon the shafts,) with the wrought iron box or frame, the conicals upon the shaft, and the sliding cast iron journal-boxes, arranged in the manner described. 2d, The combination of the rollers, the case or frame, the box, and the wide shoe, and the diagonal plates, operating in the manner described.

30. BRAN DUSTERS; William Hall, St. Louis, Missouri.

Claim—The combination of the flanch with its arms, and the head with the scuppers, with the brushes and fans, as described.

31. CONVERTING RECIPROCATING INTO ROTARY MOTION; C. A. Harper, Fort Worth, Texas.

Claim—Producing the rotary motion of the shaft and saw by the reciprocating racks, in combination with the gear-wheel, spring pawls, drum, shafts, and wheels, as described.

32. PROJECTILES FOR FIRE ARMS; John Holroyd, Washington City, D. C.

Claim—Constructing the projectile with the reversed curved grooves, A and B, on the rear and front, as set forth.

33. SEWING MACHINES; Henry Hudson, Three Springs, Pennsylvania.

Claim—The carrying of a self-feeding automatic stitch-forming device (like that described, or its equivalent), over the surface of the stretched or stationary fabric, as set forth.

34. HYDRANTS; William Iams, Baltimore, Maryland.

Claim—The movable cylinder and tube, when combined with the fixed piston upon the supply pipe, and so constructed and arranged in relation to the supply pipe, that its elevation shall open a direct communication with the main, in the manner specified.

35. MACHINES FOR PREVENTING ENGINES AND RAILROAD CARS FROM BEING THROWN FROM THE TRACK; A. Livingston Johnson, Baltimore, Maryland.

Claim—In combination with a locomotive and a pioneer safety car in advance of it, the bars fastened to one and extending into loops or mortises in the other, to prevent the lighter car from leaving the track, or one from mounting or riding on the other, in case of accident or sudden stoppage. Also, in combination with the locomotive and pioneer safety car, an advance of the link or drag-bar, so connected thereto, as that the propelling force transmitted through it shall tend to hold the forward part of the safety car to the track.

36. LIFE-BOAT; George W. La Baw, Jersey City, New Jersey.

Claim—The arrangement of ribs with the main rib and keel, and cutwaters, constructed as specified.

37. SAWING MACHINES; Sylvester Littlefield, Alfred, Maine.

Claim—1st, Combining with a circular saw on a vibrating adjustable arm, an auxiliary saw, as described. 2d, Arranging an arm with two guides, in such a manner that it vibrates on the arbor of the saw, and that it can be raised and lowered instantaneously, as described.

38. MACHINE FOR UNLOADING VESSELS; I. I. Magee, Fernandina, Florida.

Claim—The arrangement of the frames, A and B, with rollers and with screws, or their equivalent, as specified.

39. APPARATUS FOR PRINTING ADDRESSES ON NEWSPAPERS, &c.; C. K. Marshall, Vicksburg, Mississippi.

Claim—1st, A chain of plates or solid links, having characters of the description described, placed, cut, or set into the face of its links, and arranged to wind in scrolls upon one pulley or roller from another, as set forth. 2d, The combination of the above with an inking device that supplies the characters made on the faces of the links with ink, and with a stamping device, which will cause the respective links of the chain, as they come into play, to produce a clear impression upon the article being directed or superscribed. 3d, The employment of an inclined hopper having openings in its bottom and furnished with a spring stop, in combination with the revolving bulk-feeding arms. 4th, The combination with the features embraced in the third claim, of the raking single-feeding device. 5th, The use of the scroll-winding post-office indicating belt, with the superscribing chain, or other superscribing device. 6th, The manner, substantially as described, of effecting a combination between said belt and chain. 7th, The combination of the features embraced in the fifth claim, with the "mail" assorting box. 8th, The use of the State-indicating belt with the post-office indicating belt, and with a superscribing device. 9th, The organization of an apparatus, by means substantially as described, for accomplishing, by one continuous operation, the several results specified.

40. PROCESS OF PREPARING PAPER PULP; John Meyerhofer, City of New York.

Claim—In making paper impervious to water, mixing the alkaline solution of rosin with the pulp, and then adding what is known as English sulphuric acid, and after the sheets have been formed, drying them by contact with heated metallic surfaces.

41. SKELETON HOOP SKIRTS; Cæsar Neumann, City of New York.

Claim—Combining a series of spring hoops by means of a series of twisted cords, and thus forming a skeleton skirt.

42. METHOD OF MOUNTING AMBROTYPES; John S. McClure, Mobile, Alabama.

Claim—The employment of a concave back ground or surface, in combination with an ambrotype picture, as described.

43. TACKLE BLOCK; J. E. Palmer, St. Louis, Missouri.

Claim—The form of the block in the inside and the form of the pulley, when the two are combined and arranged as described.

44. BEE-HIVES; John W. Palmer, Port Republic, Virginia.

Claim—Providing the described bee-hives with one or more partitions, with openings, and with feed boxes, which contain separating boxes, constructed as described.

45. EMBOSSING AND FINISHING WOVEN FABRICS; Walter Ralston, Manchester, England; patented in England, November 23, 1858.

Claim—The employment of grooved, fluted, engraved, milled, or otherwise indented rollers of metal, wood, or other suitable material, driven at a greater speed than the bowl or bowls connected with them, so as to exert a rubbing or friction upon the fabric submitted to their action, and thereby produce an indefinite variety of pattern, as well as a bright finish or lustre, and also reversing the operation by giving the bowl a quicker motion than the pattern roller.

46. MACHINES FOR POLISHING RICE; Charles E. Rowan, City of New York.

Claim—1st, The combination of the conductors, constructed as described, and secured within a loose wire cloth cylinder, with the scouring discs, constructed as shown, and secured to the driving shaft, so that the friction of the grain will cause the cylinder to revolve, and lift and deliver the grain through the machine. 2d, In combination with the parts described, I claim the tubes and openings, arranged so that the dust may escape and air may enter to cool the contents of the cylinder during the scouring operation. 3d, Placing the feeding screw upon the same shaft that carries the scouring discs.

47. REEFING FORE-AND-AFT SAILS; Wm. R. Satterly, Setauket, New York.

Claim—The combination with and above the triangular sail, C, of another triangular sail, B, which has

a boom attached to it, so that when the two sails and boom are put together they form the ordinary fore-and-aft sail, operating in the usual manner; but when the sail, H, and its attached boom are removed, the small triangular sail, G, remains.

[This invention consists in dividing a fore-and-aft sail in a line running diagonally from its upper and inner corner to its lower and outer corner, thus making two triangular portions, and so applying these two portions of the sail, in combination with a boom and a detachable gaff, that when, in hard weather, it is desirable to reduce sail, the gaff and outer portion can be expeditiously disconnected from the inner portion and from the boom, and that the upper corner of the inner portion can be connected with the throat halyard, and hauled up to its place without the boom, thus effecting the reduction of sail more quickly than can be done by the ordinary mode of reefing, and obviating the chafing of the reef on the boom, by making the inner portion of the sail constitute a trysail.]

48. STEERING APPARATUS; Nathaniel Snow, Jr., Boston, Massachusetts.

Claim—The steering apparatus, consisting essentially of the wheel, pinion, rods, and yoke, arranged as described.

49. BIT-STOCK; N. Spofford, Haverhill, Massachusetts.

Claim—Arranging the socket of a brace with a slot, in combination with a thumb-screw and projections, or their equivalents, as specified.

[This invention consists in arranging the socket with a slot that divides said socket into two parts, which are forced together by means of a thumb-screw, so that they adapt themselves to different sizes and different bevels of the shanks of bits, and the lower end of the socket is furnished with a projection that serves to retain the bits with quite a moderate pressure of the thumb-screws.]

50. CHURN; E. N. Sprinkle, Marion, Virginia.

Claim—As an improvement on the churn patented to Hatfield & Goldsmith, on July 13, 1858, the combination of the perforated obliquely arranged dashers with the single inclined stationary guard, as set forth.

51. CONSTRUCTION OF BURNERS FOR VAPOR LAMPS; Robert Steel, Philadelphia, Pennsylvania.

Claim—The combination of a metallic gas-generating chamber and burner, applicable to a lamp, chandelier, or other gas fixture, for the purpose of generating vapor or gas from burning fluid, and consuming the same as fast as it is generated, thereby producing a superior artificial gas light, as described.

52. STOVES; John G. Treadwell, Albany, New York.

Claim—Providing the door with an inclined projection on one side and a hinged rack bar on the other, when said door is used in connexion with the cross bar and with the damper, as constructed, the whole being arranged as described.

53. MOLE PLOUGHS; George Whitcomb, Springfield, Ohio.

Claim—The construction of a flexible mould by the combination of sections which are not attached to each other, but by being held in place by the chain, or its equivalent, as set forth.

54. PEGGING MACHINES; Luke H. Ward, Marlboro', Massachusetts.

Claim—The particular arrangement and combination of the feeding apparatus, consisting of the levers, R Q and O, spring, and wheels, in connexion with the lever, U, and its stud, and the awl and driver operated by the levers, W and X, in connexion with the peg-feeding apparatus and pointed saw for cutting off the pegs.

55. AUGER; Simeon Wood, Worcester, Massachusetts.

Claim—The combination of the chipping bit or bits with a band or hook, having teeth or cutters on its bottom edge.

56. PLATFORM SCALES; R. F. Wolcott, Claremont, New Hampshire.

Claim—1st, The combination of the two graduated wheels, screw, and bar, arranged as set forth. 2d, Attaching the lever, I, to the platform, levers, H H, and rod, arranged as described. 3d, The construction and arrangement of the fulcrum arms of the shaft, projections, and plates of the hangers, and the plates of the beams, as set forth.

57. APPARATUS FOR COOLING LIQUIDS; Jean Louis Baudelot, Havencourt, France, Assignor to Henry Migeon, Wolcottsville, Connecticut; patented in France, April 13, 1856.

Claim—A cooling apparatus for liquids, composed of a vertical range of pipes passing the liquids successively from the lower to the upper pipes in said range, in combination with the perforated trough, or its equivalent, supplying the other liquid which trickles over the surface of said range of pipes, as set forth. Also, in such a cooling apparatus, a series of teeth or projections on the under side of the horizontal pipes, for the purpose of conducting or distributing the liquid falling successively from one pipe to the other.

58. SKATE STRAPS; Edward Behr and L. Froelich, Assignor to Edward Behr, City of New York.

Claim—The rod fitted longitudinally in the stock, provided with screw sections, with cylinders fitted thereon, and one end of the heel and toe straps attached to said cylinders, the latter being provided with the ratchets, d k, into which the pawls, e l, catch, as set forth.

59. TEA AND COFFEE POTS; Thomas Bishop, Assignor to self and James M. Bishop, Plainville, Connecticut.

Claim—The arrangement of the area, flanches upon the lid, with the apertures, in the manner described.

60. SHANK-LASTER; D. G. Chase, Boston, Massachusetts, Assignor to George Parr, Buffalo, New York.

Claim—The jointed cross-bars provided with the swivel jaws and swivel nuts, in connexion with the right and left screw shaft, arranged as set forth.

61. METHOD OF ADJUSTING CIRCULAR SAWS; John Colville, Assignor to self and T. L. Colville, Wilmington, North Carolina.

Claim—The expansion ring or plate of copper, or any other suitable metal capable of being expanded, for setting or adjusting the saw properly upon the shaft at any given point or points, when the same is interposed between the saw and fixed collar.

62. FLY-TRAP; Wm. Elwell, Assignor to self and N. O. Mitchell, Gardiner, Maine.

Claim—The two boxes, of a quadrangular or other shape, provided with sliding glass tops and sliding bottom, in combination with the perforations surrounded with projecting pins, for the purposes, arranged in the manner set forth.

63. CAST METAL PULLEYS; John A. Evarts, Assignor to Homer Curtis, West Meriden, Connecticut.

Claim—Forming the core of the sheel by covering the wheel with the sand, and having the hole made

through the core, so that, in casting the sheel, the pintle or axis of the wheel will be cast simultaneously with the sheel, and the wheel, when the sand is removed, be properly adjusted with the sheel, as described.

64. ROTARY PUMPS; John Jewell Flanders, Assignor to self and E. G. W. Bartlett, Manchester, N. H.

Claim—The combination of the revolving, annular, inverted gear, the pinion, and stationary crescent, arranged to operate in the case, as described.

65. APPARATUS FOR MANUFACTURE OF COAL OIL; H. K. Symmes, Assignor to self and R. W. Holman, Newton, Massachusetts.

Claim—1st, An oil retort, A, in combination with the gas retort, D, or its equivalent, for the purpose of saving the gas which escapes from the oil retort, and to improve its quality. 2d, In combination with the two retorts, A and D, I claim the pump, or its equivalent, for the purpose of imparting to the gas the necessary pressure.

66. POCKET ALARM; Isaac Goodspeed, Norwich, Connecticut, Assignor to self and George A. Mansfield, Boston, Massachusetts.

Claim—The pocket, thief, and burglar alarm, constructed in the form and manner described. Also, the combination and arrangement of the independent lever, adapted to cap and cock the alarm, and while both the cap-tube and hammer are arranged within, and do not project outside the shell or case.

67. STEAM BOILERS; Stephen H. Head, Assignor to self and Wm. P. Parrot, Boston, Massachusetts.

Claim—In combination with the furnaces and the lateral passage and damper, chamber, F, located at the front of the furnaces, and between them and flues, for the purpose and in the manner set forth.

68. TELEGRAPHING MACHINES; George M. Phelps, Troy, New York, Assignor to the American Telegraph Co.

Claim—Producing from a magneto-electric battery, the momentary electric currents required for actuating the printing mechanism, by giving momentary motion to the armature or other current-inducing part of the magneto-electric battery, by means of a set of finger-keys, which, when depressed, are controlled in their action upon the current-inducing part of the magneto-electric battery, by a mechanical contrivance which constantly moves in harmony with the unintermittingly-revolving type-wheel. Also, increasing the capability of the instruments for telegraphing, by so increasing the speed of the transmitting device and type-wheel in relation to the motion of the parts which perform the printing, that two or more types shall pass the platen while the printing mechanism is acting once. Also, turning the cylindrical platen while each impression is being made, by means of rings of teeth upon the type-wheel and platen. And, finally, making a revolving wheel or shaft turn the corrector, armature, or another wheel or shaft, a certain fixed distance, with the same speed as itself, at any time and any desired number of times, by the use of a ratchet wheel, catch, guide, and detent, arranged together, and, with the said driving and driven wheel or shaft, for conjoint operation, as set forth.

69. CLOTHES DRYER; Charles A. Gale, Boston, Assignor to Albert S. Hall, Malden, and A. R. Davis, Cambridge, Massachusetts.

Claim—The combination, substantially as described, of the mantel, shelf, and the folding slats, arranged as set forth.

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70. CLOTHES IRONING APPARATUS; Corintha Alden, Cassadaga, New York.

Claim—The arrangement of the box with the follower, or its equivalent, in combination with the tank, as specified.

71. CORN PLANTERS; Ephraim C. Allen, Le Roy, New York.

Claim—The arrangement of the various parts of the seeding machine described.

72. REFINING SUGAR; John Aspinall, London, England; patented in England, February 8, 1859.

Claim—The method described of effecting the blowing-up or melting of raw sugars; that is to say, by so supporting or upholding the sugar that successive portions will be brought into contact with the water, whereby the sugar will be melted at or near the surface.

73. COMPENSATING PENDULUM; Merrick Bemis, Ashburnham, Massachusetts.

Claim—Arranging a part of the rod in the form of a bow or sectoral bend, and applying to such bend or part a clasp or bow of metal having a different expansive ratio.

74. DEVICE FOR APPLYING STEAM AS A MOTOR; Robert Blair, Malugin Grove, Illinois.

Claim—The combination with a radial lever or frame, and circular railway, and central revolving, power-transmitting shaft of a traction steam engine, when the crank axes of said engine radiate from the central shaft, and the inner traction wheels are made of smaller diameter than the outer one.

75. CORN SHELLERS; Nelson Burr, Batavia, Illinois.

Claim—The peculiar arrangement of the section, provided with the ring and placed relatively with the cylinder and adjoining sections.

76. SHOEMAKING TABLE; Thomas Carpenter, Battle Creek, Michigan.

Claim—The movable bottom, arranged in combination with the bench and compartment box, constructed as described.

77. STEAM VALVES; R. Carkhuff and B. Chalfant, Lewisburgh, Pennsylvania.

Claim—The peculiar arrangement of the slide and traverse bar, t, which form the valve of the steam chest, the bar, u, and the cross-arm of rod, whereby said valve is allowed a lateral as well as a longitudinal movement within the chest.

78. GIRTH BUCKLES; L. C. Chase, Boston, Massachusetts.

Claim—Constructing a buckle with wings, or their equivalents, and furnished with holes.

79. WATER-METRES; B. S. Church, Manhattanville, New York.

Claim—1st, The arrangement of the partitions in the trough, as described, in combination with the air-tight chamber, D, chamber, F, and tubes, whereby that portion of the water which does not pass through the measuring buckets is prevented carrying off any of the air in the chamber, D. 2d, Arranging in the air chamber, D, a float, in combination with a valve, or its equivalent.

80. PACKING FOR SLIDING GAS-LIGHTS; George Clay, City of New York.

Claim—The combination with the pipe, D, shell, and pipe, B, of the elastic tube, when the latter is fitte d

so that its central portion will contract and press upon the burner or upon the sliding pipe, so as to form a gas-tight joint.

81. PROJECTILES FOR RIFLED ORDNANCE; J. W. Cochran, City of New York.

Claim—1st, The band of copper, or other wire, applied in combination with the cup or cup-like frame attached to the rear of the projectile. 2d, The expanding ring, applied in combination with a conical surface, formed behind a shoulder on the front part of the projectile.

82. PROJECTILES FOR RIFLED ORDNANCE; J. W. Cochran, City of New York.

Claim—The application to a projectile for rifled ordnance of a covering, or of one or more bands, composed of a coil or coils of copper, or other wire, wound upon its exterior.

83. RAILROAD GATE; D. W. Comstock, Chicago, Illinois.

Claim—Placing the ends of two pairs of adjoining rails on a rising and falling platform, when the latter is suspended from the short arms of crank levers, the long arms of which carry the panels of a gate.

84. RAILROAD CAR SPRINGS; Wm. F. Converse, Harrison, Ohio.

Claim—1st, The combination of a clamp with a disc spring, in the manner explained. 2d, In connexion with the above, I claim the series of annular steel discs of unequal diameter.

85. CHURN-DASHER; N. B. Cooper, Gratis, Ohio.

Claim—The arrangement of the arms on the two points, one on each side of the upright, when the upright is made removable by means of the ways.

86. STEAM BOILER; Edward Crane, Dorchester, Massachusetts.

Claim—A fire-box surrounded by a water-jacket, the combination of the tubes in the fire-box with the boxes or chambers, so that a number of tubes shall have the same connexions through the said boxes or chambers with the water-jacket and steam chamber, and shall also be capable of being put in and taken out of the boiler at the same time. Also, the use of tubes coiled or folded into the fire-box, and connected with the water-jacket and steam chamber through the boxes or chambers, as described, of such length in proportion to their diameter that all the water entering them at the lower end shall be converted into steam in the lower portion, and the steam be superheated in the upper portion before it is discharged into the steam chamber. Also, the use of tubes in the steam chamber for discharging the steam generated in the tubes in the fire-box, so bent that the superheated steam issuing therefrom shall be discharged into a drum, around the chimney and against the chimney, in the first instance, and then against the surface of the water. Also, the use of the drum around the chimney in the steam chamber for securing the discharge from the tubes, and checking the disturbance of the water through the whole extent of the steam chamber. Also, the combination of the blow-off cocks with the stop-cocks, for the purpose of blowing off each section of tubes separately. Also, the use of the tube coiled around the chimney, for the purpose of taking the steam from the steam chamber, at the point where it has the highest temperature.

87. RAILROAD CAR WHEELS; Edward Crane, Dorchester, Massachusetts.

Claim—A wheel having its rim and tire secured together by india rubber vulcanized in place.

88. CLOTHES DRYER; Munson C. Cronk, Auburn, New York.

Claim—The combination and arrangement of the hollow post, the sliding piece, brace cords, the hub, the stands, the radial arms, and the ring, in the manner specified.

89. PANS FOR EVAPORATING CANE JUICE; C. A. Desobry, Plaquemine, Louisiana.

Claim—The heaters, of inverted cup form, applied within the pan, in combination with the system of connexions and the two series of pipes below the pan, as described. And in combination with the said heaters, connexions, and two systems of pipes, I claim the pipes passing through the said heaters, as described.

90. PUMPS; Jacob Edson, Boston, Massachusetts.

Claim—1st, The peculiar manner in which I support the cylinder upon the flanches, in combination with the vacuum chamber, for the purpose of insuring an unobstructed passage between the said chamber and the induction pipe below the valves. 2d, The manner described of securing the induction pipe to the pump by means of the projecting bearing points, operating as set forth. 3d, The described combination and arrangement of the division plate and the cylinder, whereby the body of the pump is divided into two distinct chambers, the one serving as an air or water chamber, and the other as a vacuum chamber.

91. LETTER SCALES; Thaddeus Fairbanks, St. Johnsbury, Vermont.

Claim—Not only with its pendulous weight, K, connected with the scale pan by a forked arm, provided with bearings for receiving and resting on knife edges of a bar, extended from the steelyard, as specified, but with a bar steelyard made without any fork, and extended into a stationary staple or stop, arranged in the manner specified.

92. SASH-FASTENER; John M. Forrest, Norfolk, Virginia.

Claim—The springs and the ratchets, as constructed, in combination with the levers and cord, operating as described.

93. MANUFACTURE OF GAS; Leonard D Gale, Washington City, D. C.

Claim—The treatment of bitumen, bituminous coal, and their distillates, or their equivalents, by first converting the volatile portions to a state of vapor, at a temperature below a cherry red heat, and then forcing the vapor so generated into contact with a red-hot surface, in such a manner that the gas generated may be instantaneously removed from the said heated surface, and thus be prevented from further decomposition.

94. MACHINES FOR HOISTING MARL, &c.; Thaddeus A. Granger, Wilson Co., North Carolina.

Claim—The construction of the cap timber, in combination with the supporting timber which forms the swivel, to allow the beam to be moved to any point desired.

95. MANUFACTURE OF GAS; Leonard D. Gale, Washington City, D. C.

Claim—The treatment of all woody, resinous, and fatty bodies, as well as all tarry matter, except bitumen, bituminous coal, and other distillates, by first converting the volatile portions to vapor at a temperature below a cherry red heat, and afterward forcing the vapor so generated into contact with a red-hot surface in such a manner that the gas generated thereby may be instantly removed from said heated surface, and thus be prevented from further decomposition.

96. APPLYING PRESSURE TO TOP ROLLS OF DRAWING MACHINERY; Noah E. Hale, Nashua, New Hampshire.

Claim—The arrangement and combination of the drawing rolls, straps, attached at the ends of said rolls, adjustable bars, lever, weight, rod, bell crank lever, and hanger, as described.

97. CARRIAGE SEATS; E. H. Harris, Palmetto, Georgia.

Claim—Attaching the seat to the body of the vehicle by means of the bars and rods, so as to permit of a certain degree of play of the seats or movement thereof, independent of the body.

98. PLOUGHS; J. P. Harris, Eyhalia, Mississippi.

Claim—The combination of the separately adjustable and removable mould-board with a subsoil share situated behind and below it—the said subsoil share being also separately removable, to allow the separate use of said mould-board.

99. MACHINES FOR PULLING AND CUTTING COTTON AND CORN-STALKS; Horatio F. Hicks, Grand View, Indiana.

Claim—The combination of the reel, paddle, drum, and cutter, operating as set forth.

100. SEWING MACHINES; Wm. Cleveland Hicks, Boston, Massachusetts.

Claim—As my method of controlling needle thread in sewing machines, by a combination of mechanism, as described, by which a bar or wire, through which the thread passes and by which the thread is tightened and loosened, shall have the described motion combined, firstly, to be drawn up by the needle bar, or its equivalent, during its entire upward motion; secondly, held at rest until the needle-eye is at or near the material to be sewed; and thirdly, to be disengaged and allowed or caused to fall by its own gravity, or by the assistance of a spring, for the purpose of gaining the amount of motion lost by remaining at rest during the first part of the downward motion of the needle bar.

101. HORSE-SHOE; N. E Hinds, Cooperstown, New York.

Claim—1st, The wider and thicker enlargement of the toe or fore part of the shoe. 2d, The trough-like concave form of the underside of the shoe and the raised edges that ensue, as a consequence of the construction of said concave form. 3d, The construction of calks made in a V or double V-form.

102. CIDER MILLS; A. D. Hoffman, Belleville, Michigan.

Claim—The combination of the crushing rollers, pressure rollers, and endless apron, when the crushing rollers are provided respectively with teeth and recesses, and the pressure roller provided with the yielding bars and canvass covering.

103. PULLEY BLOCKS; S. F. Lewis, San Francisco, California.

Claim—1st, The arrangement and combination of the pulleys, shoe, and eccentric within the block. 2d, The teeth or projections and stop, formed respectively on the pulley and shoe, to operate as set forth.

104. ABDOMINAL CORSETS; James P. McLean, City of New York.

Claim—A corset or belt with cork brackets or projections on its zone, the upper or top edge of such brackets being beveled, in combination with the abdominal pads which form a part of the lower section of the corset or bandage, and are held in their places by the same.

105. KNIFE-CLEANER; James McNamee, Easton, Pennsylvania.

Claim—The upper socket, with its pad operated by the socket, F, with its pad, and the reservoir, the pad of the lower socket is rendered adjustable in respect to the reservoir.

106. SEEDING MACHINES; Allen N. Merrill, Batavia, Illinois.

Claim—1st, The employment or use of a longitudinal adjustable shaft, provided with cylinders, having different sized seed cells, in connexion with perforated bars, slides, and plate, arranged as set forth. 2d, The arrangement and combination of the spout, conductors, shoe spouts, and elevating arms on shaft, connected to the conductors.

107. PORTABLE GAS APPARATUS; John H. Miller and Samuel Albright, Grafton, Virginia.

Claim—A portable gasometer furnished with a central gas discharge pipe, a central guide rod, a flexible connecting pipe, and one or more ratchet bars, and arranged in a frame which is provided with one or more spring pawls, for use in a railroad car, or other traveling apparatus, which is subject to a jolting or vibrating motion, for the purpose of supplying gas to a series of gas burners.

108. SKIRTS; Charles Minzheimer, City of New York.

Claim—The expanding joint and strings, or their equivalents, at the back of the skirt, in combination with the openings in the other.

109. CORN PLANTERS; Oliver P. Moran, Haynesville, Missouri.

Claim—The combination of the curved concentric aperture in the bottom of the seed-box with the sliding strike and measuring holes, for the purpose of charging said holes from the seed-box with the least possible weight upon, and impediment to, the motion of the dropping wheel. Also, the combination of the concentric vibratory arm and projecting pin thereon, with the measuring holes, for the purpose of imparting the proper movement to the dropping wheel. Also, the arrangement of the instant valve upon the curved weighted hinge, which is pivoted to the sides of the chamber in a position nearly vertically over the valve, in combination with the slotted connecting rod, for the purpose of producing a superior thickness and delicacy of action on the valve.

110. CASTING CAR WHEELS; Austin W. Moses and Joseph A. Springer, Philadelphia, Pennsylvania.

Claim—The described method of casting railroad car wheels, by pouring the central portion of the wheel, independently and in advance of the tread, to allow said central portion to cool and contract to any desired degree before adding the metal forming the tread of the wheel: said end is accomplished by the employment of a ring, composed of any convenient number of segments, or their equivalents, and arranged to operate in combination with the annular part of the flask.

111. STRAW-CUTTERS; Jacob H. Mumma, Harrisburgh, Pennsylvania.

Claim—1st, The employment of a hawk-bill cutter, constructed and arranged in connexion with a cutter bar of a straw-cutter, operating as set forth. 2d, The slat bed, for the purposes of not only cleaning the material from dirt, but also as a feed to the rollers. 3d, The employment of the rib, feed rollers for crushing and dividing the sheet of material to be cut, arranged and combined with a hawk-bill cutter and bar.

112. SAWING MACHINES; Adrian V. B. Orr, Lancaster, Pennsylvania.

Claim—The oscillating lever, in combination with the spring and feed lever, and operating either a single saw or a pair of saws.

113. HEATING APPARATUS; George R. Osbrey, Providence, Rhode Island.

Claim—The combination of the alcohol reservoir and vaporizer with a lamp for heating the same, when such vessels are connected by a liquid pipe and a vapor pipe, said pipes acting in such connexion to maintain

a constant level within the vaporizer. Also, combining with such device for vaporizing, a conical disseminator and a convex deflector.

114. Machine for Cutting Boot and Shoe Soles; George W. Parrott and Charles K. Bradford, Lynn, Mass.

Claim—The combination and arrangement of an automatic feed, sole by sole, with the cutting knives.

115. Clarifying and Refining Sugar Juices, &c.; Hiram G. C. Paulson, Flatland, New York.

Claim—The application of alcohol, in combination with water, in all the proportions as stated, and at the temperature of boiling of said combined liquids to the melting or dissolving, boiling or treating raw sugars or juices of saccharine substances.

116. Cooking Range; William Pellet, City of New York.

Claim—The combination with a central fire-grate having openings in its side, and with the side roasting chambers or spits, of dampers, which can be adjusted so that the roasting may either be effected in the side chambers, by direct action of the burning coals, or by the heat radiated from the sides of the fire chambers.

117. Sweat-knife for Cutting Hat and Cap Linings; Edward R. Pye, City of New York.

Claim—The employment or use of the knife on the projection of the bar, and secured thereto by the set-screw, in connexion with the pointed wheel attached to the projection.

118. Portable Turn-table; John Robinson, of Eli, Sharptown, Maryland.

Claim—The adjustable sliding turn-table, constructed as specified.

119. Stoves, Ranges, &c.; Josiah M. Reed, Boston, Massachusetts.

Claim—The application and construction of the flue with its door, as described.

120. Insect Powder-blower; Peter Reynard, City of New York, and Victor Varin, Brooklyn, New York.

Claim—1st, The ball, attached directly to the chamber or neck, and acting to blow the powder out of the neck or chamber, either with or without the valves, as specified. 2d, The holder, composed of the rod, e, and ring, provided with the rod, g, and the button, to act on the elastic ball, as described.

121. Stump Extractors; C. Bird Pate, Moore's Mill, Indiana.

Claim—The arrangement of levers and spar, as set forth.

122. Sewing Machines; Israel M. Rose, City of New York.

Claim—The combination of two needles and a shuttle, to operate as set forth, for the purpose of producing a stitch of the structure described.

123. Stoves; Christian Charles Schieferdecker, Baltimore, Maryland.

Claim—The combination of the central air space, containing material refractory to heat, with the series of surrounding ascending and descending smoke flues, arranged as described.

124. Sewing Machines; Charles Scofield, Adams, New York.

Claim—1st, The auxiliary feeding plate, Q, with pins or teeth on its surface, in combination with the perforated, slotted, main feeding plate, N, when said plate, Q, combines in itself the properties of a spring, and of a feed bar, and is otherwise arranged in the manner described. 2d, The arrangement of the pivoted lever, adjustable collar, pressure pad, and needle lever, in the relation shown to one another, and for united operation in the manner set forth. 3d, The lever, made elastic, laterally pivoted at n, provided with a pin, and coupled to the pressure pad by an adjustable collar, in combination with the needle lever and the recess in the standard. 4th, The looper, W X U T, when the part U T is made rigid and attached to the horizontal rock shaft, and the part W X is made yielding or with a spring, and formed or arranged on one side of part U T, and in the relation shown to a projection on the peripherical surface of the actuating cam. 5th, The combination of the adjustable intermediate plate with the jaws of the looper, for the purpose of adapting the same looper without removing it from the machine, which is used for sewing either in the double-looped or other stitch made with two threads, for sewing in the chain-stitch.

125. Machine for Making Box Joints; James Stimpson, Baldwinsville, Massachusetts.

Claim—1st, The combination of the hollow bit, the cutters, or their equivalents, operating to form the tenons. 2d, In combination with the above, I claim the auger bit, operating to form the holes to correspond with the tenons.

126. Carving-knife; Chester W. Sykes, City of New York.

Claim—The combination of a knife and shears, as described.

127. Straw-cutters; Harvey Trumbull, Central College, Ohio.

Claim—The combination of a self-adjusting spring pressure clasp, to or with an automatic rake, for the purpose of feeding the material to the knife.

128. Gates; Nathaniel Waterbury, Fond du Lac, Wisconsin.

Claim—The arrangement and combination of the pendulous rod and weight with the axis of the pulley.

129. Hot-air Furnaces; James Whitehill, Frederick, Maryland.

Claim—1st, A furnace, constructed with two separate fire chambers and grates, with an air passage between the chambers, closed at their sides, but open at the bottom and top. 2d, The combination of the peculiar labyrinthian air passage and the peculiar furnace described. 3d, The combination, with the peculiar furnace and peculiar labyrinthian air passage described, of the curved cold air pipe.

130. Cotton Gins; Ferdinand Wuterich and Jacob Kœrber, City of New York.

Claim—The arrangement of the finger shafts, C and D, operating in the manner described, and acting together so that, while the fingers of the shaft, C, during its revolution, pull the cotton out of the hopper, the fingers of the shaft, D, take the cotton from the former, and deposit the same upon the guiding rollers.

131. Mode of Confining the Seat of the Driver on City Railroad Cars; Wm. C. Allison, Assignor to self and John Murphy, Philadelphia, Pennsylvania.

Claim—The combination of the board, rod, with its collar, and the catch, when the said rod serves the double purpose of supporting the seat, and, in conjunction with the catch, of maintaining the seat folded up out of the way.

132. Handles for Smoothing Irons; Henry C. Brown, Buffalo, New York, Assignor to Charles O. Brown, Dalton, Massachusetts.

Claim—A ventilating smoothing iron handle, constructed as described.

133. Railroad Car Springs; Wm. E. Cooper, Dunkirk, New York, Assignor to Charles D. Gibson, City of New York.

Claim—The combination and arrangement of groups of four springs by and with the suspension bracket or stirrup, arranged in the manner described.

134. Sleeping Cars; John Danner, Assignor to self and J. M. Jay, Canton, Ohio.

Claim—The combination of the hinged back, d', with the hinged and reversible frame, and removable piece, arranged to operate in relation to seat and false back of the back, B'.

135. Apparatus for Heating Hydro-carbon Liquids; Pearson B. Kitchen, Assignor to Wm. H. Marshall, Philadelphia, Pennsylvania.

Claim—The application to gas generators of a hot air chamber, and the submerging of one or more air pipes therefrom, into and upon the chemicals, for the purposes set forth and described.

136. Lamps; A. H. Knapp, Assignor to self, E. H. Barstow, and A. R. Trowbridge, Newton Centre, Mass.

Claim—The wick portion, arranged as described.

137. Composition for Detergent Purposes; Ambrose Lovis, Assignor to self and Charles E. Hodges, Boston, Massachusetts.

Claim—The described cleansing, bleaching, and disinfecting liquid, consisting of an alkaline silicate combined with chlorine.

138. Method of Driving Piles; James A. Whipple, Boston, Assignor to self and George A. Stone, Roxbury, Massachusetts.

Claim—The method or process of driving piles by exploding charges of gunpowder, or its equivalent, between the pile and a fulcrum or resistance, so that the force of the explosion shall wholly or partially act to drive the pile in the direction of its length, or nearly so.

139. Portable Locomotives; Joseph Barrans, Caledonia Terrace, Queen's Road, Peckham, County of Surrey, England.

Claim—1st, The method described of supporting the front portions of traction or portable steam engines, by means of a spring or elastic beam or lever, at or near the middle thereof; the said beam or lever being arranged constantly to occupy a position in a vertical plane passing through the axis of the boiler, by having its near and front ends applied and jointed respectively to the bottom of the barrel of the boiler, and to the fore-carriage. 2d, The application and use, in traction engines, of tensional rods or bars for retaining the driving wheel centres at the proper distance asunder from the axis of the ground driving wheels. 3d, The application and use, in traction and portable steam engines, of ground driving wheels, in two or more sections capable of being put in and out of working action, for the purpose described, and such wheels having teeth holding projections upon their peripheries of the form and arrangement described.

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140. Method of Printing Floor Cloths; James Albro, Elizabeth, New Jersey.

Claim—The production of grained or variegated designs upon oil cloth, by applying the printing blocks to cushions or pads upon which the colors have been previously "grained" or "combed."

141. Breech-loading Fire Arms; Wm. H. Arnold, Washington City, D. C.

Claim—1st, The combination of the cap-lever, shackle piece, pin, and grooves, with the breech piston, for operating as described. 2d, The combination of slide piece, joined as described, with the pin and hammer, operating as set forth. 3d, The cavity in the piston, for the reception of the rear projecting tail-piece of the projectile.

142. Reclining Chair; J. M. Baird, Wheeling, Virginia, and Levi F. Smith, Stonington, Connecticut.

Claim—1st, The combination and arrangement of the oscillating pedestal, vertical lever, the sliding seat frame, and stand, as described. 2d, In combination with the fall, the vibrating foot-board, the oscillating bars, and pitman, or their equivalents, in the manner described.

143. Mechanical Movements; Wm. H. Baker, Tamaqua, Pennsylvania.

Claim—The drum, placed loosely on the shaft, and having ropes or chains, and a weight or weights attached to it, in connexion with the toothed spring, toothed wheel, train of wheels, fly-wheel, and cam, fitted between the friction rollers of the shaft, as set forth.

144. Gauge for Iron Axles; Wm. C. Bamberger, Washington City, D. C.

Claim—An axle gauge, constructed in the manner described.

145. Ship-building; Jacob W. Banta, Buffalo, New York.

Claim—Extending the planking upon both sides of the bow, and uniting their contiguous ends forward of the dead wood, the planking and dead wood being chamfered to admit of such extension and union.

146. Burr Cylinders; James Bidwell, City of New York.

Claim—Securing the toothed plate in place by providing them with projections or recesses, to fit to corresponding recesses or projections provided in or on the interposed packing rings fitting to the body of the cylinder.

147. Mole Ploughs; Aaron Bowers, Jacob H. Griggs, and John Wilson, Monmouth, Illinois.

Claim—The combination of the peculiarly constructed mole with the scrapers and presser, arranged as set forth.

148. Tool for Cutting Corks; Adolful Brass, Newark, New Jersey.

Claim—A cutter consisting of two curved blades, two spring or hinged arms, and a sliding ring, with extensions, as set forth.

149. Machine for Packing Starch, &c.; Isaac A. Brownell, Providence, Rhode Island.

Claim—1st, The tunnel, as constructed, for the purpose described. 2d, Attaching the cams to upright strips of wood or metal, which receive and transmit to the said cams the motions which reduce in bulk the commodity placed therein. 3d, The wheel, F, for holding and carrying the blocks, in combination with the cam wheel, G, and the stud, &c., for imparting the motion which reduces the commodity in bulk, and also the intermittently-rotary motion to the wheel, F. 4th, The arrangement of the foot lever, and the rod, V, and

the punch, with the rod and plate, for the purposes specified; also, in combination with the punch, the pawl, rod, y, and sliding hub, for liberating the wheel, r, at the proper time. 5th, The rail and the studs, &c., with the stop for withholding, in the manner specified.

150. KNITTING MACHINES; Joseph Bullock, Cohoes, New York.

Claim—The employment, in combination with such a circular series of stationary needles, of a series of lever-like jacks, applied as described, and having a movement between the needles in a direction radial to the centre of the machine, but no rotary motion.

151. MARTINGALE RING; George T. Bushnell, Birmingham, Connecticut.

Claim—A martingale ring whose exterior edge is thinner than the interior, in combination with an exterior band, whose edges extend down upon the sides of the ring, forming a hollow or corrugated band on its surface.

152. FASTENING METAL HOOPS ON COTTON BALES; John T. Butler, Natchez, Mississippi.

Claim—The combination of the buckle frame, made without any opening in the border of it, with the hooks, when the latter are received through the former and held in place by the pressure of the bale against them.

153. NOZZLES FOR FIRE ENGINES; Lysander Button and Robert Blake, Waterford, New York.

Claim—The removable ring, constructed and combined with the adjutage, as set forth.

154. ORE-WASHER; William L Carter, Marietta, Pennsylvania.

Claim—A double conical-shaped vessel, provided with teeth or cutters inside at the end where the ore is received, and the grinders, with the means described for supporting and adjusting the same.

155. MACHINES FOR FOLDING PAPER; Cyrus Chambers, Jr., Philadelphia, Pennsylvania.

Claim—1st, So arranging the drop roller that it shall co-operate with one of the feeding rollers in feeding-in the sheet. 2d, Forming grooves in the folding rollers for the reception of the adjustable guides. 3d, The combination of the carrying roller with the folding roller for carrying in the sheet. 4th, Giving the curved bars a projection beyond the surface of the rollers, for the purpose of raising or bearing off the sheet from the folding roller. 5th, Moving the folding knife in an arc around one of the folding rollers. 6th, Placing the centre of the arc in which the folding knife moves, near or within the periphery of the roller around which it moves. 7th, Corrugating the sheet as it passes from one folding mechanism to a position to be acted upon by the next, for the purpose described. 8th, Turning or conducting the paper by means of the bent bars, in the manner specified. 9th, The combination of the bent bars with the straight bars and adjustable stop, arranged in the manner described. 10th, The combination of the bent bars with the tapes and stop, for the purpose specified. 11th, The oscillating packer or plunger, having its centre of motion below the point of contact with the folded sheets. 12th, The yielding catches for preventing the return of the packed sheets, constructed as described. 13th, Making one or more notches in the plunger for cleaning the yielding catches.

156. HARVESTERS; George E. Chenoweth, Baltimore, Maryland.

Claim—The described arrangement and combination of the finger bar and main frame, whereby the bar can be folded forwards to the side of the machine with its front downwards, so that the platform can remain attached to the bar, and occupy a vertical position therewith when folded to this position.

157. CHURN; Philip L. Clow, Cohoes, New York.

Claim—1st, Hanging the outer parts of two contrarily-revolving dashers to the central portions by hinges, in the manner set forth. 2d, The arrangement of the air-pump and water reservoir with the revolving dashers and cream vessel, as described.

158. ROTARY CHURN; Aaron L. Cornell, City of New York.

Claim—The arrangement of the rotating shafts, armed with the concave or recessed crags or dashers, within the two concave or half-cylinder chambers, placed back to back.

159. APPARATUS FOR WORKING SHIPS BOATS; H. Davidson, of the United States Navy.

Claim—The boat apparatus, consisting of the reel, the attaching and detaching hooks, constructed as specified.

160. MOWING MACHINES; Thomas H. Dodge, Washington City, D. C.

Claim—1st, The arrangement and combination of the levers, standards, and cords, with shoe, whereby the driver, from his seat on the machine, can elevate either end of the finger bar independently of the other, or the entire bar. 2d, The combination of the cutting apparatus with the main frame and mechanism, so constructed and arranged that the driver can, without leaving his seat on the machine, fold up and unfold the finger bar without taking hold of it with his hand. 3d, The combination and arrangement of the levers with the driver's seat and cord or chain, whereby the driver may, when necessary, employ both his hands and his feet, together with the power of the team, to raise the finger bar and cutting apparatus. 4th, So combining mechanism with the machine as that the driver can employ the power of the team to assist to elevate the finger bar and cutting apparatus at pleasure, without changing the horizontal position of the main frame. 5th, In a reaping and mowing machine, the folding guard and rein-hitch, in combination with the driver's seat. 6th, The flexible or adjustable draft connexion to which the team is attached, in combination with the coupling arm and shoe. 7th, The spiral cutters, when constructed and arranged as shown in fig. 11, and operating as set forth. 8th, Hinging the track-clearer to the extension piece by means of the cranks, for the purposes described. 9th, So constructing the track-clearer that its weight may be adjusted, in the manner set forth.

161. COTTON SCRAPERS; Miles Earnhart, Cold Water, Mississippi.

Claim—The arrangement and combination of the double adjustments of the mould-board with the stock and rigid supporting brace, as specified.

162. TELEGRAPHIC MACHINES; Moses G. Farmer, Salem, Massachusetts.

Claim—The use of a key or circuit-breaker, which shall close one circuit before or at the same time that it opens another, in connexion with an electro-magnet with two sets of helices operating on one and the same armature lever, or two separate electro-magnets operating upon one and the same armature lever, for the purpose of transmitting two messages simultaneously upon a single wire.

163. MILK CAN; William Frost, Amenia, New York.

Claim—A milk can provided with tinned iron hoops, with their ends connected together by rivets and solder, either or both, and secured on the can by solder.

164. CONSTRUCTION OF SHIPS AND OTHER NAVIGABLE VESSELS; Rollin Germain, Buffalo, New York.

Claim—1st, Vessels for navigation when the bow and stern sections shall taper uniformly, and the vessel below its water-lines be of the form and model described, and when the relative proportions as to length, breadth of beam, and draft of water shall be such, that, if a right line be drawn longitudinally through the middle, commencing at the water-line at the bow and terminating at the water-line at the stern (when the vessel is loaded), and another line be drawn at right angles to said line along the water surface, from the water-line on one side to the water-line on the other side, at the middle of the part of the vessel where a cross-section below the water-line is greatest, and from every point in this last described line right lines be drawn to each end of the first-described line, the average of all the angles made by these last lines with the first-described line shall not exceed two degrees. 2d, The combination of the fin-like projection with a vessel constructed, below its water-lines, as described. 3d, The combination of the overhanging deck with a vessel constructed, below its water-lines, as described. 4th, Constructing the pilot-house and smoke-stacks (separately,) in respect to their forward and rear parts, in a tapering or wedge-like form. 5th, The combination of the notched plates, the iron knee, and rivets, with a vessel constructed as described.

165. CYLINDERS FOR SMOOTHING WALKS, &c.; James Giles, Dryden, and C. B. Tompkins, Ulysses, New York.

Claim—Making cylinders for rollers and other purposes, with grooved metal flanches, into which wood staves are fitted, which form the rolling surface. Also, the mode of making and applying cross-bars between rollers, when two or more cylinders are required for smoothing surfaces, as described.

166. APPARATUS FOR STARTING CITY RAILROAD HORSE CARS; George Hamel, Abington, Pennsylvania.

Claim—The relative arrangement of the levers, the pawls, in combination with the rest pins and inclined planes, the draw-bar, in combination with the inclined pieces and the staying pins, for holding and releasing the draw-bar. Also, in combination with the said draw-bar, the devices, H I K L and M, arranged so as to be operated by the cam for their re-adjustment, in the manner described.

167. POTATO HARVESTERS; Jacob E. Hardenbergh, Fultonville, New York.

Claim—1st, The employment or use of an adjustable share, in connexion with the rotary screen, and with or without the discharging device, the parts being applied to a mounted frame, and arranged to operate as set forth. 2d, The rotary discharging device, placed eccentrically on the screen, kept in proper relative position therewith by the plate, and rotated from the screen by the projection. 3d, The combination of the share, rotary screen, and discharging device, when attached to a mounted frame, and arranged so that the screen and the discharging device may be adjusted independently of the share, and the discharging device rotated by the screen, and kept in an eccentric position thereon for the purpose specified.

168. MACHINES FOR GRINDING GLASS; Albert H. Hook, City of New York.

Claim—The combination of the inclined carriage and cylinder, arranged in the manner specified.

169. BEDSTEAD-FASTENING; Elisha G. Hopkins, Penn Yan, New York.

Claim—The construction and arrangement of the parts, C D E and F, as specified.

170. HARVESTERS; M. G. Hubbard, City of New York.

Claim—The universal joint in the reel in which the arms and wings are pivoted, or flexible and yielding. Also, the combination of the flexible reel with the flexible platform, in the manner specified. Also, the outer reel-arm, in combination with the flexible reel and platform, as described.

171. PROPELLER; Daniel Hughes, Rochester, New York.

Claim—The arrangement of the spiral screw propellers, so that their blades shall work nearly in contact, and thus present a broad, unbroken, resisting surface.

172. BELT-AWL AND PUNCH; Wm. J. Innis, Providence, Rhode Island.

Claim—The combination of the punch, awl, and spring handle, as described.

173. FASTENING FOR JAIL DOORS; Enoch Jacobs, Cincinnati, Ohio.

Claim—1st, Making the casings of heavy iron doors of double angle iron, as described. 2d, Fastening iron doors by swinging bars, working in the outside cavity of the double angle iron casing, in the manner set forth.

174. CHURN; Thomas A. Jebb, Buffalo, New York.

Claim—The arrangement of the short dash-blades and long dash-blade relatively to each other and to the segmental stave, so that the short dash-blades will revolve within, and the long dash-blade under, the lower beveled end of the segmental stave.

175. SEEDING HARROWS; Arthur E. Jerome, Monroeville, Ohio.

Claim—1st, Making the axis on which the harrows rotate hollow, and in the form of a drill-tooth. 2d, Combining a corn planter or a broadcast sower with the harrows.

176. PLOUGHS; W. T. Jones, Joliet, Illinois.

Claim—The attaching of the mould-board, land-side, and share, to the standard, by means of a joint or hinge, the plates or leaves of which are provided with screws, and arranged as set forth. Also, constructing the standard with a forked upper end, in connexion with the rod, lug, and flanch, arranged to admit of the proper attachment of the beam and handles to the plough.

177. BILLIARD TABLE; J. G. Kappner, City of New York.

Claim—The combination with the cushion rail of the circular guide plate, pivoted cross-arm, and hook, as described.

178. MACHINE FOR RABBETING WOODEN SOLES FOR SHOES; John Kimball, Boston, Massachusetts.

Claim—1st, The combination of the convex guide rest with the pressure roller and feed roller, arranged as set forth. 2d, In combination with the rotary cutters and feed rollers, the fixed tool, in the manner set forth.

179. HARVESTERS; William A. Kirby, Buffalo, New York.

Claim—Locating the raker's seat over the open space at the side of the platform, so that the delivery may be at any point along the whole side of said platform that the raker may desire.

180. BEER PITCHER; William S. Mathews, Meriden, Connecticut.

Claim—A pitcher with two strainers, one at the bottom and the other at the top of a partition.

181. EXTENSION TABLE; Louis Meyer, Columbus, Georgia.

Claim—The beveled arms or braces, central cross-piece, and stops, on the brace arms.

182. Mode of Operating Brakes on Railroad Cars; David Mumma, Jr, Harrisburgh, Pennsylvania.

Claim—The employment of the movable plate provided with a shoe, in combination with a friction wheel, n, a lever, and wheel, a, so arranged that friction from said shoe and plate may be applied, in the manner set forth. Also, the arrangement of the brake chain attached to the axle, so the said axle may be employed as a lever.

183. Potato Harvesters; J. D. Otstot, Springfield, Ohio.

Claim—The arrangement and combination of the bent lever, excavator, rotary rake, hopper, and driving wheels, in the manner set forth.

184. Machine for Making Wooden Boxes; George F. Palmer, Farmington, New Hampshire.

Claim—1st, The arrangement of the cutters, in combination with the stationary saws and with the adjustable saws. 2d, The employment of the expanding sliding platforms, arranged in combination with the saws.

185. Washing Machine; John Patton, Arcadia, Indiana.

Claim—The spiral springs, clamp, and the hook, in combination with the groove in the cylinder, poles, chains, cross-piece, rollers, board, compound wringer and rinser, and cylinder, when operated as described.

186. Cultivators; Isaac N. Pyle, Decatur, Indiana.

Claim—The arrangement and combination of the curved, pivoted wing rods, curved adjustable central rod, looped sockets, vertical movable standards, rods, braces, and handles, as described.

187. Machine for Cutting Tenons; J. R. Perry, Port Clinton, Pennsylvania.

Claim—1st, The combination of the right and left-hand screw with the cutter heads, in the manner set forth. 2d, Constructing the cutter bits with lugs to receive the shoulder bits, as specified.

188. Egg-beater or Ice-cream Freezer; John Pyne and Washington Barr, Harrisburgh, Pennsylvania.

Claim—The ice-cream freezer or egg-beater, the bottom having corrugated, perforated circles, in which the shaft and wires of the dasher revolve, as described.

189. Apparatus for Elevating Cannon; George M. Ransom, of the United States Navy.

Claim—The application of trunnions and bearings, or equivalents, to the nut, in combination with jointing or hinging the upper end of the upper screw to the cascable, or to a saddle attached to or supporting the cascable. Also, the combination of the cascable saddle with the elevating screw and cascable of the gun.

190. Lath Machine; John H. and Albert E. Redstone, Indianapolis, Indiana.

Claim—1st, Operating the knife plate by the sliding bar and groove or yoke, in combination with the roller attached to the knife plate. 2d, The guides, roller, slide, pins, and slots, combined as set forth.

191. Bakers Ovens; Nathan F. Rice, New Orleans, Louisiana.

Claim—A series of ovens placed on different floors of a building, and heated successively by products of combustion, directed and controlled by the described combination of flues, dampers, and air chambers.

192. Letter Envelope; Albert C. Richard, Newtown, Connecticut.

Claim—A letter envelope, having the properties fully set forth.

193. Billiard Table Cushion; George D. Sharp, City of New York.

Claim—The combination of the hollow cushion with a square or slightly beveled face for the ball to impinge against, thus producing a spring of greater ductibility than other billiard table cushions have.

194. Fore-iron for the Use of Shoemakers; S. A. Shurtleff, North Carver, Massachusetts.

Claim—The adjustable beading plate, applied to a stock and arranged as specified.

195. Sewing Machines; E. C. Singer, Port Lavaca, Texas.

Claim—The feed device, the essential features of which are the plate, the block, and the lever and stop, operated by the grooved sliding bar, arranged in the manner set forth.

196. Billiard Register; Ferdinand M. Sofge, Macon, Georgia.

Claim—The arrangement of springs, operated by means of cylinder, A, upon tally, d. Also, in combination with the above, the cylinder, c, in connexion with the tally, 1 and 2, or any number of tallies and springs.

197. Pouncing Hat Bodies; W. H. Tupper, City of New York.

Claim—The employment of an air blast to cleanse and hold the body within the hollow cone, while the said body is being rotated and pounced.

198. Ploughs; John T. Townsend, Brenham, Texas.

Claim—The arrangement and combination of the land-side, standard, mould-board, share, braces or arms, and cross-bar.

199. Machines for Inserting Eyelets; William H. Rodgers, City of New York.

Claim—A single punch, operated as described, in combination with the connexion lever, cutter, and yielding spring guide point.

200. Portable Pump; William T. Vose, Newtonville, Massachusetts.

Claim—An improved pump, constructed with a barrel and the foot-stand or rest, arranged together as described.

201. Mode of Advertising; Edward Weibe, Brooklyn, New York.

Claim—The described mode of exhibiting advertisements, operated automatically.

202. Signal Bell; Joseph A. Woodward, Philadelphia, Pennsylvania.

Claim—The lever escapement bar, with the elliptical slot and projecting point, in combination with the projecting point of the hammer or striking arm.

203. Steam Pumping Engines; William Wright, Hartford, Connecticut.

Claim—1st, The application of the forked yoke, inclined arms, and levers, in conjunction with an independent hydraulic cylinder or engine, for working the valves of a steam engine properly, opening and closing them, and effecting the cut-off at the proper points, and performing all the offices and obtaining all the useful results of a well regulated and effective valve gearing. 2d, The combination of the forked frame and inclined arms for controlling and regulating the length of stroke between certain points on the faces of said planes, and graduating it between these points at the will and pleasure of the engineer, so as to reduce the clearance

in the steam cylinder to a minimum. 3d, The manner in which the main valve of the hydraulic cylinder is brought into action at proper and fixed intervals, and working the steam valves of the engine independently of the forked frame and its inclined arm, should the latter part of the gearing fail, from any cause, to assist in performing their duty. 4th. The application of the auxiliary valve, in combination with the main valve of the hydraulic cylinder, for effecting, at the proper point, the opening of the steam valves instantaneously and ahead of the steam piston; or in other words, for giving the lead to the valve as effectually as an eccentric will on a crank engine, and forming a cushion for the piston at the end of the stroke, reversing the movement and holding the valves wide open until the cut-off is accomplished. 5th, The mechanism for accomplishing, positively, the cut-off and insuring the closing of the valves, and in connexion therewith, the method of regulating and adjusting the same to any required point of the cut-off that the beneficial working of the engine may demand.

204. PUMPS; William Wright, Hartford, Connecticut.

Claim—1st, The construction of the pump by the application of an auxiliary barrel to the working or brick barrel, and connecting both barrels by a double heat valve, thus effecting a combined opening through the auxiliary and the bucket valves, with a minimum lift of said valves greater than the area of the pump itself, and obviating to a great degree the frictional resistance that would be produced by passing all the water through the pump bucket valves alone, preventing all throttling, and permitting the engine to work more regularly and economically. 2d, The placing of one pump above the other, and connecting both together, and passing the load of one through the working and auxiliary barrels, and the bucket and auxiliary valves of the other, and vice-versa, thus allowing the engine to have complete control over the column of water.

205. MODE OF TELEGRAPHING; Samuel K. Zook, City of New York.

Claim—The construction of the telegraphic lines of metallic conductors of a high conducting power, having the portions of the wire conductors which are between the two telegraphic extremes in the earth, or submerged in the ocean or rivers, not artificially insulated, but using the earth or water as the natural insulator of those parts, in combination with the artificially insulated portions of the wire on each or either side of the battery or batteries.

206. MACHINERY FOR DRYING CLOTH; Charles F. Bennett, Warehouse Point, Assignor to Julius H. Baker, East Windsor, Connecticut.

Claim—The extra adjusting vibratory arrangements, whereby the cloth can be spread and straightened on the selvage while passing over the rollers.

207. HARVESTERS; John Butter, Buffalo, New York, Assignor to J. A. Saxton, Canton, Ohio.

Claim—The combination of the shoe with hinged and adjusting rods, plate, and cup, arranged as set forth.

208. TEMPERING STEEL WIRE; Wm. Darker, Jr., West Philadelphia, Assignor to J. B. Thompson, Philadelphia, Pennsylvania.

Claim—Combining the drum by which the steel ribbon or wire is drawn through the fire and bath, with the main or counter shaft, from which it derives motion, by means of a pair of cone pulleys or belt.

209. MAKING CLASPS FOR HOOP SKIRTS; J. H. Doolittle, Assignor to Wallace & Sons, Ansonia, Connecticut.

Claim—Manufacturing metal clasps for fastening the tapes on hoop skirts, and for similar or analogous purposes, by cutting the scraps from the metal strips, so that the blanks will be attached thereto, and while thus connected, fed to the swaging or raising device, and swaged in proper form to produce the clasps.

210. COCKS FOR WATER-CLOSETS; Darius Wellington, Assignor to C. Wellington, Boston, Massachusetts.

Claim—The employment or use of the valve and plunger, connected by the stem placed within a suitable cylinder, and arranged relatively with the supply and discharge pipes, to operate as set forth.

211. CURTAIN FIXTURE; Lewis White, Assignor to self and E. P. Miller, Hartford, Connecticut.

Claim—The application of the bracket and brake, in combination with the pulley, cord, and pendant lever, thus forming a double brake.

212. MACHINE FOR BUNDLING KINDLING WOOD; Wm. L. Williams, Assignor to self and Thomas J. O'Connor, City of New York.

Claim—1st, The follower, acting to lift a bundle of wood through a ring or opening, and separate the same from the mass of split kindling wood in the trough. 2d, The ring separator or the knife, acting to split or separate from the mass of kindling wood a bundle. 3d, The combination of the follower and ring separator or knife, in the manner set forth. 4th, Two or more slides with curved ends, acting against and on opposite sides of a bundle of kindling wood to compress the same previous to being secured by a wire or string. 5th, The compressing levers, in combination with the slides to act in compressing the bundle of wood. 6th, The twisting jaws or pincers, fitted to receive the wire in the manner specified, so that the act of revolving said jaws to twist the wire shall first draw the wire tight. 7th, The weight hung on the levers and acting to bring the ends of the wood level.

213. ROTARY ENGINES; Henry C. Rice, Worcester, Administrator of the estate of John H. Hathaway, deceased, late of Milbury, Massachusetts.

Claim—The combination, with the cross-head which carries the abutment or cylinder head, of the rock shaft, the toggle, and the vibrating arm, applied and operating as described, in combination with the guide arms. And in combination with the above-mentioned rock shaft, I claim the arm, slide, lever, and eccentric, applied to produce an intermittent or remittent motion of the said rock shaft.

214. TYPE-SETTERS AND DISTRIBUTORS; Thomas W. Gilmer, Charlottsville, Virginia, Administrator of John B. Gilmer, deceased, late of same place.

Claim—Withdrawing the type from the type-case and setting them in line in the composing stick, without the aid of intermediate carrying mechanism, but by the direct application of the composing stick to the type-case. Also, distributing the type to the type-case by the direct application of the distributing stick to said case. Also, in combination with the type-case and the holding dog, arranged and operated so as to retain the type as they descend opposite the mouth of the case, and release the type when the mouth of the composing stick is in position to receive them. Also, arranging the type-case, so that, by a retrograde movement of the case, the type is discharged into the composing stick. Also, in combination with the composing stick, the spring mouth-plate to hold the type as they enter the stick. In combination with the spring mouth-plate, I claim the lip, l, arranged to assist in withdrawing the type from the case, and to prevent their turning or falling out of the composing stick as they are withdrawn from the case. Also, discharging the type into the case through the bottom of the distributing stick. Also, in combination with the distributing stick, a separating and discharging mechanism to the type, arranged so as to separate the front type from the rear, and from them into the type-case.

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215. CLOCK ESCAPEMENT; Charles J. Addy, Roxbury, Massachusetts.

Claim—The independent gravity pallet, pivoted to a fixed bearing, in combination with a recoil pallet swinging with the pendulum.

216. METAL-PLANING MACHINES; Moses Allan, Utica, New York.

Claim—1st, The construction of the apparatus shown, and its adaptation to the use of the ordinary planing machine, and its combination therewith. 2d, The combination of the bearing stands and the disc with the carriage of the machine, connected and arranged as described.

217. COMBINATION STEAM GAUGE; E. G. Allen, Boston, Massachusetts.

Claim—The combination and arrangement of the several instruments requisite to enable the engineer to regulate the proper working of steam machinery, as set forth; the said instruments being inserted in one case, and having the hands or other indicators upon one face or dial plate, in the manner specified.

218. WASHING MACHINE; Samuel Barber, South Brunswick, New Jersey.

Claim—1st, The combination with the lever, for operating the frame, of a curved extension guide for adjusting the frame, in the manner set forth. 2d, The arrangement with the above, of the serrated arc on top of the dash-board, for adjusting the inclination of said board.

219. BEE-HIVES; Eli Bartholomew, Cleveland, Ohio.

Claim—The arrangement of the outer casing and the inner casing, in relation to each other, and the ventilating openings in cover, which cover is furnished with a top and boxes.

220. SAW-SET; Jorred Beach, Freeport, Pennsylvania.

Claim—The arrangement of the guide with slot, levers, connecting link, and set-screws, used in connexion with the gauge, graduating rest-plate, regulating screw, anvil, and set, arranged and constructed as described.

221. AUTOMATIC CANAL BRIDGES; D. Berry, Huntington, Indiana.

Claim—The bridge, arranged to work on inclined ways, and connected by a chain and wheel to a shaft, which is connected, by gearing, to segments in line with the bridge and the boat, so that the former can be actuated by the movement of the latter.

222. WASHING MACHINES; Milton B. Bishop, Whitingham, Vermont.

Claim—The means of operating the two wash-boards, viz: the arrangement and application of the two sets of levers or brakes, together and with respect to the wash-boards, disposed one over the other and in the tub. Also, in combination with the upper wash-board and its brake, the rock shaft, the slide bar, and the springs, meaning also to claim the combination of the said rocker shaft, the slide, and springs.

223. COMPOSITION CEMENT OR MORTAR; Wendlin Bleser, City of New York.

Claim—The mortar described, made and employed as set forth.

224. LADIES BUSTLES; Joseph W. Bradley, City of New York.

Claim—A bustle consisting of a waistband, composed in parts of strips of metal, or other elastic material, and a spiral spring, tapered from the middle towards each end, applied to and combined with such waistband.

225. STEAM VALVES; Lockwood B. Brooks, City of New York.

Claim—Rendering the two parts of the balanced puppet valve, adjustable, relatively to each other, by connecting the stem to the sleeve by the yoke, arranged in the manner set forth.

226. ROAD-SCRAPERS; George and David C. Caward, Prattsburgh, New York.

Claim—The reversible, revolving, and adjustable blade, with the adjusting boxes, made and operated as specified. Also, the circular arms with the wheels, made as specified.

227. BAGASSE FURNACES; A. J. Chapman, Bayou Goula, Louisiana.

Claim—1st, The employment of the central air-heating chamber, having discharge passages leading into the furnace in its sides, and a central descending flue, in combination with a double-walled furnace having an air-heating chamber between its walls, and discharge passages through its inner wall, leading into the fire-chamber. 2d, The combination of the partitioned and valved air-heating chamber, between the walls of the furnace, with the upper and lower hot-air passages and mixing chamber. 3d, The combination of the auxiliary valved flue, leading directly to the chimney, with the valve, boiler-flue, and the furnace. 4th, The combination of the valve in the hopper with the cylinder feeder, carrier drum, cam, and lever, as set forth.

228. APPARATUS FOR GENERATING ILLUMINATING GAS; Matthias P. Coons, Brooklyn, New York.

Claim—1st, The particular form and manner of constructing and combining a gas-generating retort, consisting of a fusion chamber and barrel, as represented. 2d, The diaphragm, j, in combination with the chambers, F and D, and diaphragm, N, in the manner specified. 3d, The chamber, H, constructed in combination with the other apparatus specified. 4th, The chamber, K, as attached to the cover, in connexion with the escape pipe, with a stop-cock attached, in the manner specified. 5th, In combination with the apparatus specified, the projecting ridge on facing rim or flanch, and the corresponding groove in the door; also, in combination, the yoke or bar and crank screw, as combined, and also the hook hinges, as set forth.

229. CHILDREN'S SLEDS; Benjamin P. Crundall, City of New York.

Claim—Connecting the head and neck of the horse to the bottom, or in front thereof, of the child's sled, having spring or other runners, in such a manner that the pole may be secured under the bottom of the sled.

230. LOCOMOTIVE ENGINES; Edward Crane, Dorchester, Massachusetts.

Claim—The combination, in a locomotive, of a boiler and engine, with a water tank, coal box, blower, and baggage department, on one long truck frame suspended underneath the axles of the wheels.

231. RAILROAD CARS; Edward Crane, Dorchester, Massachusetts.

Claim—The use of a single long truck for the support of a railroad car, when the frame of said truck is constructed and suspended as described. Also, the use of cylindrical bars of iron, passing under the frame of the truck, and nearly in contact with the rails, for the purpose of keeping the truck frame from striking the rails or ground in case the cars leave the track.

232. HARROW TEETH; D. M. Cummings, Enfield, New Hampshire.

Claim—1st, Constructing the tooth of a harrow with prongs and sharp-pointed shields, as specified. 2d, In combination with the above, the wedge-shaped plate, in the manner described.

233. LAUNCHING FLAT BOATS; John and Ebenezer Davis, Matildaville, Pennsylvania.

Claim—The combination of the hinged projection beams with the shoulders, pulleys, and ropes, as set forth, when used in connexion with the permanent staging.

234. APPARATUS FOR SUPPLYING SAW-DUST TO FURNACES; Harrison Doty, Cardington, Ohio.

Claim—The employment of the latch, arranged to operate as in the manner set forth. Also, the arrangement of the hinged bottom provided with the adjustable weight, with the latch provided with adjustable weight, and with stationary box.

235. WAGON JACKS; Charles Douglas, Hebron, Connecticut.

Claim—1st, The combination and arrangement of the lever, pawl, ratchet plate, rod, and stock, as described. 2d, The pawl, when used for the double purpose of a pawl on the ratchet plate, and a fulcrum for the lever.

236. GRAIN-BINDERS; C. H. Durkee, Hartford, Wisconsin.

Claim—1st, The combination of the traveling segment, jointed arm, its rod, connecting rod, and rack, operated by pinion and rack. 2d, The swinging rack, in combination with the traveling segment for receiving and holding the pinion while the end of the arm is being passed through the loop. 3d, The loop-holder, trip-block, and block, arranged as set forth.

237. VULCANIZING RUBBER COMPOUNDS; Asahel K. Eaton, City of New York.

Claim—The use of a metallic bath, as described.

238. CABBAGE-CUTTING MACHINE; Gustavus G. Elias, Lancaster, Pennsylvania.

Claim—The specific arrangement and combination of the sliding box, with its notches, flat spring, and retaining plates, the double coned spiral spring, with its square bottom and armed top, the counter cutting knives and central division on the table, provided with legs; the wheel, crank, or connecting rods, made as specified.

239. COTTON PRESSES; E. A. Elliott, Port Gibson, Mississippi.

Claim—1st, The employment of the hinged forms forming part of the box, in combination with the follower, R, said forms being so arranged as to receive the cotton and to act as guides for the follower. 2d, The employment of the weighted follower, R, in connexion with the spring bolts, whereby the loose cotton is instantly, at the proper time, brought down and held in the proper space, to be acted on by the followers, F. 3d, The arrangement of the doors with reference to the box and the position of the bale therein, when fully compressed, by means of which I am enabled to apply and secure the covering without sewing. 4th, The arrangement of the rod and stops with reference to nut and its movement, whereby the clutch is not only disconnected from the pulleys at the proper times, but also prevented from connecting by accident or otherwise, as described.

240. COMPOUNDS OF CAOUTCHOUC AND ALLIED GUMS; George August Engelhard, City of New York, and Rudolph Franz Heinrich Havemann, New Brunswick, New Jersey.

Claim—The described product, obtained by the action of chlorine on gums, such as india rubber or gutta percha, whether in solution or in substance, in either of the modes pointed out, or in any other that is substantially the same, and which will produce a like effect.

241. SAW-MILLS; A. J. Emlaw, Grand Haven, and Elliott Richmond, Kelloggsville, Michigan.

Claim—1st, The arrangement of the friction wheel and pulleys in connexion with the shafting, for the purpose of giving the feed and gigging back movement to the carriage, as set forth. 2d, The arrangement of the adjustable bars on the carriage, screw rods, and adjustable wheels on shaft, whereby the bars may be adjusted nearer to or further from each other, to suit the length of the stuff to be sawed.

242. RUBBER BELTING; Dennis C. Gately, Newtown, Connecticut.

Claim—Machine belting or banding, manufactured with surfaces of india rubber or gutta percha, and having surfaces which are as nearly as is practically possible perfectly smooth, as described.

243. MAKING RUBBER BELTING; Dennis C. Gately, Newtown, Connecticut.

Claim—The method described for manufacturing machine belts or bands of india rubber or gutta percha, by rolling them in thin sheets of flexible metal and then heating them.

244. HARROWS; Oliver C. Green, Dublin, Indiana.

Claim—The described arrangement of the harrow teeth, beams, wheels, arms, lever, rods, and rack, constructed in the manner set forth.

245. COTTON HARVESTERS; John Griffin, Louisville, Kentucky.

Claim—The employment or use of annular chambers communicating with the cups of the suction tube or tubes, by means of perforations, and communicating with a steam or air chamber by means of flexible tubes, as set forth.

246. GRAIN SEPARATORS; P. Griswold and H. H. Seeley, Hudson, Michigan.

Claim—The combination with the screen of the rocking bar and vibrating bar, as described.

[The invention consists in giving the lowermost screen in the shoe of the separator a compound movement, and using in connexion therewith a supplemental screen having a vertical movement only.]

247. EVAPORATING VESSELS; John P. Hale, Kanawha, Virginia.

Claim—The superheating of the steam or vapor arising from the evaporation of the brine, as described.

248. CARRIAGE TOPS; A. J. Hall and Russell Patton, Morristown, Vermont.

Claim—The construction of bows for folding carriage tops with joints, as set forth.

249. FERTILIZERS; Louis Harper, Riceville, New Jersey.

Claim—1st, The preparation of the peat, or muck, or lignite, and their mixture with sulphate of lime, soda, potash, and magnesia, when required to form the bases of the preparation intended for composition of the fertilizer. 2d, The addition of phosphate and bi-phosphate of lime to the above bases, and the impregnation of the above mixture with ammonia, in the manner described, so as to be converted into simple and double salts, as above stated. 3d, The combination of peat, or muck, or lignite, prepared as described, with green sand marl.

250. DOOR-FASTENING; Lewis G. Hoffman, Waterford, New York.

Claim—The described button, as a new article of manufacture.

251. Cut-off Arrangements for Steam Boilers; Julius Hornig, Newark, New Jersey.

Claim—The employment, for opening and controlling the closing of the cut-off valve, of a revolving and swinging cam, applied in combination with and operated by a revolving wrist-plate and a grooved disc, as described.

252. Propelling Wheel; Joshua L. Husband, Philadelphia, Pennsylvania.

Claim—The combination of the guides, the arms, the connecting rods, the double cranks, and the sectional paddles, operating together in the manner described.

253. Coal Hods; R. W. Huston, Calais, Maine.

Claim—The arrangement of the bucket with the external casing, when the bucket is provided with a rim or flanch around its top, and with a pin on its bottom, upon which it revolves, and when the external casing is provided with a top which fits snugly around the bucket and over the rim or flanch with a channel, and with a door to said channel, as specified.

254. Ditching Machine; George E. Inman, Buffalo, New York.

Claim—1st, The cutter, arranged and operating as set forth. 2d, The arrangement of the adjustable roller, under the elevated part of the share. 3d, The arrangement of the caster-wheel, plough, cutter, adjustable roller, plough-share, and side pieces, relatively to each other, as described. 4th, The arrangement of the two driving wheels on the same shaft, when placed so near together as to track within the ditch cut by the horizontal share.

255. Rotary Steam Engines; Luther Johnson, Grand Ledge, Michigan.

Claim—1st, The employment, in combination with a sliding abutment fitted to the outer stationary cylinder, of an inner revolving cylinder, having a concentric groove or channel closed permanently in one place by a piston extending all across it, as described. 2d, Operating the abutments and the cut-off valves by means of the same cams, through the agency of rollers applied to the abutments and yokes, rods and levers, and arms, n n, applied to the cut-off valve, arranged as described. 3d, The two sliding reversing valves, applied in combination with the two sets of steam-pipes in relation to the abutments, and operated simultaneously by a single lever, as described.

256. Ox Yokes; H. P. Judson, Bethlehem, Connecticut.

Claim—The arrangement of the peculiar rotary spring disc, curved rods, and horizontally moving locking bolts, as described.

257. Lathe Attachment; Cheney Kilburn, Burlington, Vermont.

Claim—The rotating reciprocating knife, in combination with the carriage provided with the gouging tool and V-shaped cutter, pattern, recess, and support, arranged as set forth.

258. Manufacture of Paraffine Candles; Elisha C. Leonard, New Bedford, Massachusetts.

Claim—My process of treating paraffine in the manufacture of candles therefrom, whereby I am enabled to dispense with a refrigerating air bath cooled by artificial means, my improvement or invention consisting in the employment, in manner described, of the atmospheric temperature and the refrigerating water bath, after the first cooling of the candle in the water bath.

259. Railroad Car Axles; Edward J. Mallett, City of New York.

Claim—The combination and arrangement of the parts, as represented, for the purpose of forming an axle on which the wheels shall have an independent motion, constructed as described.

260. Traction Locomotives Carrying their own Railway; Charles F. Mann, Troy, New York.

Claim—So applying the endless chains as to make them not only the track for the supporting wheels of the locomotive to run on, but also the means by which the engine propels the locomotive along the ground.

261. Fertilizers; James J. Mapes, Newark, New Jersey.

Claim—The production of a fertilizer by combining guano and sulphate of ammonia, or its equivalent, with burnt bones, or their equivalents, when the said bones, or equivalent, have been treated by sulphuric acid, as specified, prepared in the manner set forth.

262. Scythe-rifles; Thomas J. Mayall, Roxbury, Massachusetts.

Claim—A rifle for sharpening scythes, &c., formed of india rubber or gutta percha, with which emery, sand, or other suitable gritty substances are incorporated.

263. Harvesters; William Morrison, Carlisle, Pennsylvania.

Claim—Providing the rear end of the finger with the open slot, whereby I am enabled to readily remove the stationary cutters and fingers, and to replace them without detaching the bolts or nuts which secure the fingers to the finger bar.

264. Boilers for Treating Paper Stock; Martin Nixon, Philadelphia, Pennsylvania.

Claim—The close spherical kier or boiler, journaled on hollow trunnions, and provided with a perforated floor, steam-pipes, and elevating and distributing pipes, constructed and arranged in the manner set forth, to boil paper-stock under a heavy pressure, by the combined action of an upward current of steam and a downward current of hot alkaline solution, and admitting of the ready inversion of the said boiler for the discharge of its contents when cooked.

265. Vapor Lamps; John K. O'Neil, Kingston, New York.

Claim—The arrangement of the auxiliary burner in connexion with the gas generating chamber, in such a manner that a cessation of its action on said chamber may at any time be effected without extinguishing its light by the separation of said burner from its influence on said chamber, as described. Also, the spiral revolving shade, in combination with the auxiliary burner, as described. Also, the construction and arrangement of the burner and graduating tube, in combination, as described.

266. Sewing Machines; William Pearson, Windsor Locks, Connecticut.

Claim—The combination of the vibrating looper, the cam flanch which operates it, and the vibrating bar carrying the friction rollers, arranged as set forth.

267. Manufacture of Paper Pulp; J. B. Palser and G. Howland, Fort Edward, New York.

Claim—The boiling of the straw or other stock for about four hours, under a pressure of from 110 lbs. to 130 lbs., in a solution of caustic alkali, of a strength indicating from 3½° to 3¾° Beaume, in the manner set forth.

268. Horse Power Machines; Wm. Phelps and W. H. Hanford, Sycamore, Illinois.

Claim—The combination and arrangement of the wheels and rollers on truck, and wheel and friction rollers on track, and friction rollers on rotary track, with rotary drive wheel and friction rollers, constructed as described.

269. Elastic Enema Syringes; Francis B. Richardson, Boston, Massachusetts.

Claim—The improvement in india rubber syringes, which consists in combining the india rubber or gutta percha, or other water-proof bag, with the suction end of the syringe, in the manner described.

270. Sewing Machines; T. J. W. Robertson, City of New York.

Claim—1st, The employment, in combination with the needle of a sewing machine, of a plate, constructed as described, for the purpose of laying and holding braid, gimp, or other material, upon the surface of the fabric. 2d, The arrangement of the guides to extend past the centre and on each side of the needle-hole, as set forth. 3d, The employment, in combination with a braid-holder, of the adjustable slide, for the purpose of flattening and opening the braid and preventing its kinking.

271. Machine for Chamfering and Crozing Kegs or Casks; John A. Seaman, St. Louis, Missouri.

Claim—The rotating arms provided with the adjustable jaws, the adjustable rotating ring fitted to the annular plate by the screws and guides, the plate being provided with the tool-holding levers attached to the guide shafts and supported by the springs, and the shafts connected to a treadle frame, combined to operate as set forth.

272. Guides for Sewing Machines; Lemuel W. Serrell, Brooklyn, New York.

Claim—1st, A spring tucker, acting to fold the edge of the hem against the plate of the hemmer when combined with the adjusting screw, whereby the pressure of the tucker on the goods and the opening or mouth left for their passage are regulated. 2d, The horn, in combination with the tongue, as specified. 3d, The arrangement of the hem-spreader stock and gauge, as specified. 4th, Attaching the guide or hemmer to the sewing machine by a cylindrical pin or hinge, to permit the said guide or hemmer to be turned up or inverted, so that the edge of the cloth, at the beginning of the hem, can be properly entered and folded while in this position.

273. Grain Separators; Daniel Spencer, Courtlandt, New York.

Claim—The combination with a grain separator between the fan shaft and the separating screens of a shaft and a series of sliding wheels, as set forth.

274. Composition for Protecting and Ornamenting the Surface of Wood; John F. Stark, Greensburgh, New York.

Claim—The employment of a compound composed of sulphur and alcohol, or sulphur and the alcoholic varnish described, in the proportions and manner described.

275. Apparatus for Regulating the Pressure of Water in Pipes; James Stratton, Brooklyn, New York.

Claim—The employment or use of the air chamber, diaphragm with valve, C, attached, the pipe, D, containing valve, C, and communicating with the air chamber by pipe, F, provided with the cocks, and the pipe, G, communicating with the pipe, F and B, arranged in relation with each other and the supply pipe, A, as set forth.

276. Apparatus for Elevating Water from Wells, &c.; L. Taylor, Jordan, Wisconsin.

Claim—1st, The employment or use of the springs, arranged in connexion with traveling jackets and receivers, as set forth. 2d, The means of connecting the bucket to the carriage, to wit: the lever on the carriage, provided with the loop, and the bail of the bucket with its pulley, in connexion with the pulleys on the carriage, and the taper rod and catch in the well-house, whereby the bucket is drawn up the wire or way, and dropped and raised from the well.

277. Air-heating Pipes for Blast Purposes; Samuel and John Thomas, Cattasauqua, Pennsylvania.

Claim—Supporting both of the legs of the arched pipes upon one bottom tube, so that injury to said pipes by the displacement of the bottom tubes will be prevented; and so that each bottom tube, with its connected arched pipes, may be removed and replaced, without disturbing any of the remaining arched pipes or bottom tubes.

278. Propeller Wheel; Thomas Tripp, Buffalo, New York.

Claim—A propeller wheel, having blades formed in respect to their main propelling surfaces, and also in respect to their outward arcs, as described.

279. Washing Machine; David Walling, Garrettsville, New York.

Claim—The combination of weighted arms, jointed connecting rod, H, angular lever, rod, a, vibrating dash-board, K, and dash-board, M, arranged as set forth.

280. Washing Machine; M. D. Wells, Morgantown, Virginia.

Claim—The reciprocating plunger, operated as described, in combination with the rack piece moved by the plunger, in its backward motion, and springs throwing said rack in place.

281. Cultivators; J. Whiteside and H. F. Crabill, Fuller's Corners, Indiana.

Claim—1st, The arrangement and combination of the hinged, curved shovel beams, cross-bar, and gauging wheel, as set forth. 2d, The curved draft beam, arranged as described, in combination with the cross-bar, handles, and rod.

282. Washing Machine; R. G. Wilkins, Burns, New York.

Claim—1st, The combination of an upper rotary rubber with revolving slats, with two or more lower rotating rubbers with revolving slats, arranged as described. 2d, Arranging the undulating surface of the slats in the upper rubber, so the projections come opposite to each other throughout, when the same is combined with a lower rotating rubber in which the projections of one slat are arranged opposite the depressions in the adjacent slats, and also when the slats of the upper rubber are arranged in relation to the slats of the lower rubber, as described.

283. Washing Machine; John Williams, Ashfield, Massachusetts.

Claim—The combination of straight fluted rollers, placed in the box of the machine in the form seen in the model, and two arms connected by a handle at one end, and attached by the other to the extremities of the frame which holds the four rollers.

284. Floating Batteries; E. A. Willis, Cold Spring, New York.

Claim—The combination of the central upright shaft, so applied that it may serve to anchor the battery

and that the battery may revolve around it, and a system of propellers by which the battery may be either caused to revolve around the said central shaft while at anchor, or propelled from place to place, when the said central shaft is elevated.

285. Disengaging Hook for Liberating Ships Boats; T. W. Wilson and Lewis Raymond, City of N. York.

Claim—The combination of a detachable hook, consisting of an open eye and pin combined with each other, as set forth, with a pulley block for lowering a boat. Also, the combination of a detachable hook with the davit, or object from which a boat is lowered by means of a lanyard, that is independent of the lowering tackle, in such manner that the combination as a whole operates to free the boat from the tackle by the taughtening of the lanyard.

286. Lining Tanks for Fatty Acids; Michael Werk, Cincinnati, Ohio.

Claim—The lining of the tank or metal vessel used with wood and cement, in the manner set forth.

287. Cheese Vat; C. M. Wilkins, Madison, Ohio.

Claim—The arrangement of the valves within the water chamber and vat, as described.

288. Manufacture of Nitrate of Silver Crayons; Sylvester P. Wheeler, Assignor to Moses H. Wheeler & Co., Bridgeport, Connecticut.

Claim—The manufacturing or forming of sticks or pieces of nitrate of silver or lunar caustic, with one or more wires or ribbon of metal running through the same, to which the nitrate of silver or lunar caustic adheres, and still holds to the wire, wires or ribbon, when used or otherwise, when broken.

289. Centrifugal Water Wheels; Harry Abbot, Assignor to self and Emerson Abbot, North Huron, Ind.

Claim—The combination, with a centrifugal water wheel, of a valve, located and arranged within said wheel so as to turn with it, and, at the same time, be adjustable while the wheel is in motion, by means of the tail, concentric, and adjusting lever.

290. Machines for Raking and Loading Hay; J. A. Althouse, Philipstown, Illinois, Assignor to self and F. W. Lechtenberger, New Harmony, Indiana.

Claim—The combination of the stationary rake, C, revolving rake, I, and vibrating rake, K, placed on a mounted frame, and arranged as set forth.

291. Churn-dasher; Gillett Bunting, Assignor to self and W. M. Jarrell, Liberty, Indiana.

Claim—Producing the vibratory movement in the cylindrical churn-dasher, by means of the combination of said arms with the crank portion of the driving wheel and intermediate connecting rod, when these are used in connexion with the current-breaker.

292. Mangle; James T. Coxell, Assignor to self and Edward Jones, Brooklyn, New York.

Claim—1st, The arrangement of the rollers above the table, so that the fabric will be folded by the machine. 2d, The combination with the weighted levers of the lifting ropes, so that the downward pressure of the roller may be released, and the roller lifted at the will of the operator to allow such portions of the linen that have buttons or other elevations to pass through the machine uninjured.

293. Bed Bottom; H. E. Fickett and John W. Summers, Assignors to H. E. Fickett, aforesaid, Glenn's Falls, New York.

Claim—The arrangement of the slats with the spiral springs, wires, central supports, and cross-brace, arranged in the manner described.

294. Coffee Pots; Horatio P. Gatchell, Ravenna, Assignor to E. J. Bates, Bedford, Ohio.

Claim—The forming of the walls of the cups with male and female screws, in combination with the perforated bottoms, for the purpose of compressing the ground coffee and extracting the strength of the drug by displacement, in the manner specified.

295. Mode of Applying Steam as a Motor to City Railroad Cars; William Darker, Assignor to self and J. B. Thompson, Philadelphia, Pennsylvania.

Claim—1st, Placing a steam engine and steam generator on the top of a city railroad car, when the engine, by suitable driving mechanism, is connected with the wheels of the car, to propel the same. 2d, Connecting the governor with a throttle valve and brake, arranged as set forth. 3d, The particular arrangement of the brake formed of the strip on wheel, and actuated by the movement of the yoke on its bent ends, connected with the hand lever rod, so as to allow of the adjustment of the throttle valve by hand independently of the automatic connexion. 4th, The arrangement of the bar, A′, cam, lever, and rod, connected with the bar, A′, by the arm, whereby the brake is operated automatically.

296. Knitting Machines; Augustus J. and Demus Goffe, Cohoes, Assignors to Downs & Company, Seneca Falls, New York.

Claim—The rotary burr-presser, having inclined planes between the teeth, in combination with the sliding needles, arranged in the manner described. Also, varying the eccentricity of the groove, by means of the movable pulley, spring, adjusting screw, and friction pulley, in the manner described.

297. Method of Making Copal Varnish; Liveras Hull, Charlestown, Assignor to self and A. Wheeler, Boston, Massachusetts.

Claim—My new manufacture of varnish, as composed of gum copal, camphene, and alcohol, united in the proportions in a cool state, in a closed or air-tight vessel, as specified.

298. Treatment of India Rubber; Henry W. Joslin, Trenton, New Jersey, and A. K. Eaton, City of New York, Assignors to the Joslin India Rubber Company of New York.

Claim—The treatment of the argillaceous red shale of New Jersey, or other similar geological localities, in combination with sulphur and caoutchouc, in the manner and for the purpose described, for the manufacture of india rubber.

299. Sewing Machines; James S. McCurdy, Brooklyn, New York, Assignor to J. H. Myers, City of N. York.

Claim—The vibrating lever carrying the shuttle-driver, and provided with the spring, to keep the shuttle-driver to the raceway, constructed as specified.

300. Bed-bottom Spring; Henry M. Scott, Assignor to self and Samuel Adlam, Portland, Maine.

Claim—The employment of spring hooks and clamps, for the purpose of attaching strips of webbing to the frame of a bedstead.

301. Ore Separator; Parmenas P. Parkhurst, Princeton, Massachusetts.

Claim—The washing-box or chamber, constructed with the pipe entering near the bottom, to cause a whirl

and circulation, as specified, and with the gate or overflow, as described, and in combination with such washing-box, I claim the receptacle or box and chamber, to receive the metallic particles when the gate is raised.

302. PILING RAILROAD BARS FOR RE-ROLLING; John Thomas, Assignor to self and John M. Lord, Indianapolis, Indiana.

Claim—The tie No. 7, when used for interlocking T-rail, or other old iron, and forming the pile of six rails, arranged as set forth.

303. SHOE-PEGGING MACHINE; E. T. Weeks, Assignor to S. H. Babcock, Franconia, New Hampshire.

Claim—The feeding device formed of bar, L, to which the jaws are connected, operated by the screw, ratchet, pawl, lever, and pitman, as set forth. Also, in connexion with the riving or splitting knife, the gauge, arranged as specified. And further, the elastic or yielding bar, attached to the arbor, provided with cam, and used in connexion with the segment rack, curved bars, and jaws, for the purpose set forth.

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304. SLEEVE-FASTENERS; Reuben L. Allen, Providence, Rhode Island.

Claim—A sleeve fastening, composed of the spring, cylindrical arms, hinge and catch, and hooked bar.

305. WASHING MACHINE; Seth A. Andrus, Roscoe, Illinois.

Claim—1st, The combination of the circular plate or crank with the rubber, so arranged that, by operating the said crank, I am enabled to communicate to the said rubber at the same time, a vertical reciprocating motion and a lateral vibratory motion. 2d, The combination of the caster rollers with the double spring, arranged in connexion with the rubber.

306. COOKING RANGES; Evans Backus, Stuyvesant, New York.

Claim—Attaching to a stove or range the curved plate, and the movable plate, and the continuous flue, arranged in the manner set forth.

307. MAKING HUB-BANDS FOR WAGON WHEELS; G. W. Beers, Bridgeport, Connecticut.

Claim—Casting slits or holes through the bands sufficiently large to allow the solder, or other suitable metal used in connecting the cap to the band, to flow through them and unite them.

308. WATER-CLOSET BASIN; William Boch, Sr., Green Point, New York.

Claim—A water-closet basin, having a covered annular water passage at its upper edge.

309. MACHINE FOR REGISTERING MUSIC; Henry F. Bond, Hudson, Wisconsin.

Claim—1st, The application of the bell-pull action with knees and wires to act upon the markers. 2d, The arrangement of the lever, J J J and K K K, by which the sharps are marked with double lines on the spaces or lines in music, with their corresponding naturals, the levers or markers, K K K, being made each of two pieces of tin, or other metal, and the levers or markers, J J J, playing between those two pieces. 3d, The arrangement of levers or markers, of both kinds, in a row, with proper intervals to record the music or paper ruled as represented, the staves of music being ruled of one color, with just leger lines enough of another color to write directly up or down from one staff to another, the leger lines between the two staves belonging alike to both of them, and the whole number of lines and spaces being equal to the compass of the instruments. 4th, Application of the ink or coloring matter to the cylinder, and the producing of colored marks by pressing the paper against the inked cylinder. 5th, The action of the lever, E, upon the bar marker, after the manner set forth. 6th, The mode in which the loud pedal action is marked.

310. HUB-BORING MACHINE; S. L. Bond, Greenwood, South Carolina.

Claim—The V-shaped bars or jaws, in combination with the bit arbor, arranged as shown.

311. MAKING HUB-BANDS FOR WAGON WHEELS; James A. Boughton, Poughkeepsie, New York.

Claim—The combination of the flanch and projection on the leaf and the set-screw in the open band.

312. MACHINES FOR MAKING CHAIN; John Calvin Brown, Providence, Rhode Island.

Claim—The circular disc provided with the wedge-formed projections, arranged in combination with the bell crank levers, which operate the several bending instruments, such combination operating in the manner as described.

313. PAINT CANS; Peter Brown, Brooklyn, New York.

Claim—1st, The employment of a strengthening wire within the bead, as described. 2d, The combination of the pivoted ears with the cover, lug, and can, as described.

314. QUARTZ-CRUSHERS; T. S. Brown, City of New York.

Claim—The employment or use of the tubular pestle, having a reciprocating and rotating movement, in connexion with the nipple or cone in the box or mortar.

315. TOOLS FOR HANDLING TIRE; John and Henry Brubaker, Lancaster, Pennsylvania.

Claim—The rod-handled tong, with its sliding leg and hooked end, in combination with the ring, as described.

316. HARVESTERS; John P. Burnham, Rockford, Illinois.

Claim—The employment of a spring, in combination with the lever and connecting rod, as described.

317. HARNESS YOKE; Ze Butt, Lincolnton, North Carolina.

Claim—The manner of constructing and arranging the yoke, so that its weight, or the greater portion of it, may rest upon the back instead of the neck of the horses. Also, in combination with the yoke, giving a wide base to the line of draft, either by the bolt and clevis, or any other equivalent device, for the purpose described.

318. VEGETABLE-CUTTERS; Andrew J. Chapman, Scipio, New York.

Claim—The arrangement and combination of the hinged guard or feed-board, hinged follower, and stationary slatted cutting bed, constructed in the manner set forth.

319. POTATO-PARER; William B. Coates, Philadelphia, Pennsylvania.

Claim—The handle, ferrules, guard, and blade, arranged in the manner set forth.

320. GAS BURNERS; Seth L. Cole, Burlington, Vermont.

Claim—The construction, from some good conducting material, of a gas burner, with an enlargement of

the tube at the point where the gas is discharged, and burned in the form of a globe, or the like, furnished with a slot aperture, so that the gas shall be heated to the utmost at the point where it is consumed.

321. Breech-loading and other Fire Arms; John Webster Cochran, City of New York.

Claim—1st, So constructing and applying one or more accelerating chambers, in combination with the plunger or elastic cushion, that the charge or charges in the accelerating chamber or chambers are fired by the driving back of the plunger or cushion, and that the plunger or cushion serves as a safety valve to the accelerating chambers. 2d, Combining the movable breech-piece, containing the plunger or elastic cushion, with a ring or circular frame hinged to a slide, which works longitudinally to the gun. 3d, In combination with the breech-piece, secured in place by a screw, or its equivalent, I claim the adjustable screwed bushing applied to the gun, as described. 4th, The combination of the plunger, accelerating chamber, volute spring, movable breech-piece, ring or frame, and slide.

322. Cooking Range; George Cooper, Concord, New Hampshire.

Claim—The combination and arrangement of the separating leading flues, A B C (each provided with a damper, arranged in it as explained), with flues, D E F G H, disposed around the oven. And in combination therewith, I claim the separate insulating flues, I K, arranged between the ovens, and on opposite sides of the leading flue, A, and made to open into the bottom flues, D and G, and to communicate with the flue, A, by openings provided with dampers.

323. Buttons; P. Davey, Ironton, Ohio.

Claim—The construction of the double flanched shank-piece as the basis of the button, forming on one end thereof a button and on the other a fastening, and in the middle two flanch guards, to receive the button hole and protect it from too much abrasion and friction.

324. Ploughs; A. A. Dickson, Anderson, South Carolina.

Claim—The arrangement of the peculiar shaped bar with the shares, beam, and handles.

325. Detective Register for Watchmen; Patrick H. Duffy, Somerset, Ohio.

Claim—Dropping the balls, by which the action of the apparatus is indicated, into the cells of a revolving wheel, by operating a rod and slide, in the manner described. Also, locking and releasing the rod by devices described, whereby it can be pulled, at certain times only, to drop a ball into the cells of a revolving wheel.

326. Machine for Converting Reciprocating into Intermittent Rotary Motion; Henry Ehrenfeld, City of New York.

Claim—The plate, or its equivalent, arranged with a socket, and cut or split through its centre, to operate in combination with the wheel and lever, which latter is furnished with an oblong pin, in the manner specified.

[This device is particularly intended to give motion to the feed-wheel of a sewing machine, and it is so arranged that it never fails to impart the required motion to the feed-wheel in one direction, while, in going back, it has no effect whatever on the same.]

327. Journal-box for Saw-mill Carriages; William M. Ferry, Jr., Ferrysburgh, Michigan.

Claim—A single casting, moulded with an intermediate space, and with off-setting boxes on each side of said space.

328. Railroad Hand-cars; Henry Fisher, Alliance, Ohio.

Claim—The manner of combining the hand crank-shaft with the axle of a railroad hand-car, so that, when the crank-shaft meets with any obstruction, it disconnects automatically from the axle and ceases its revolution with the same, and thus prevents a sweeping off of the operators from the platform.

329. Manufacture of Rubber Belting; Dennis C. Gately, Newtown, Connecticut.

Claim—The method described of imparting a smooth and finished surface to belts or bands of india rubber or gutta percha, the same consisting in placing them in contact with sheets or strips of vulcanized india rubber or gutta percha, and then vulcanizing them by applying heat.

330. Manufacture of Rubber Belting; Dennis C. Gately, Newtown, Connecticut.

Claim—The manufacture of belting or banding, composed either wholly or in part of india rubber or gutta percha, which consists in vulcanizing the belt or band, and giving it a smooth friction surface at one operation, by feeding the belt or band around or in contact with a series of smooth heated rollers.

331. Bench Vise; G. A. Gray, Jr., Cincinnati, Ohio.

Claim—The described combination of the handle, loose head, and catch, with the jaws, screws, and endless chain of a parallel bench vise.

332. Composition for Covering Metals; J. H. Green, Christiansburg, Iowa.

Claim—The composition described.

333. Machine for Riving Basket Splints, &c.; William J. Horton, La Grange, Alabama.

Claim—The employment or use of the rollers, three or more, knife placed in the gate, and the guide plates, arranged as set forth.

334. Toy Gun; Josee Johnson, City of New York.

Claim—1st, So arranging the spring, D, relatively to the bore, A, that D is, by a single movement of the finger, used both as a trigger and a propelling force to discharge the projectile through A. 2d, In connexion with the above, receiving the impact of the spring upon the single bearing, so that the free portion of D moves by its momentum beyond its original position, for the purpose described. 3d, The detaching surface, arranged relatively to the spring lever and barrel.

335. Railroad Switches; F. H. Joyner, Richmond, Vermont.

Claim—A pair of switches, in connexion with stationary bearing rails, as described.

336. Manufacture of Vinegar; Bernhard Kœgel, City of New York.

Claim—Converting wine, or other alcoholic liquors, rapidly into vinegar or acetic acid, by means of pumice stone, or its equivalent. Also, the tub or apparatus, as described, when pumice stone is used in the same.

337. Apparatus for Taming Horses; J. M. Lamer, Eufaula, Alabama.

Claim—The employment of the straps, A A, loop, E, and straps, D C and E, arranged and used as specified.

338. Grain Fans; Oliver Lindsey and Robert F. Strean, Washington, Pennsylvania.

Claim—The combination of division boards with the inclined plane, the screen board, and riddles, united

in the peculiar manner described, and arranged to operate in the relation to each other, and to the currents of wind thrown off by the fan.

339. FILTERS; William Linton, Baltimore, Maryland.

Claim—Arranging a clamping plate, of less diameter than the filtering cylinder, on adjusting screws of the removable head of the cylinder.

[This cylindrical filter receives the water at one of its ends, changes the direction of the course of the same, and causes it to pass in opposite directions, then to take a course back through three layers of felt, which deprive it of all impurities before it escapes at the opposite end of the cylinder.]

340. VALVE GEAR OF STEAM ENGINES; Peter Louis, City of New York.

Claim—1st, The auxiliary cylinder, having a partition and arrangement of steam and exhaust passages, and fitted with a valve, or its equivalent, and with the two pistons on opposite sides of its partition, applied in combination with the induction and eduction valves and the shaft of the main engine, so that each of said pistons, acted upon by steam admitted to its compartment of the auxiliary cylinder by the valve, serves to open one induction, and the opposite eduction valve of the main engine at the proper time. 2d, In combination with the auxiliary cylinder and its pistons, applied and operating as described, to open the induction and eduction valves of the main engine, I claim the employment of the rock shaft and its toes, so applied in combination with the said eduction valves, that while they permit the said valves to be opened by the action of the steam on the pistons of the auxiliary cylinder, they keep the said valves open as long as may be desired.

341. MANUFACTURE OF WATER-PROOF HOSE; T. J. Mayall, Roxbury, Massachusetts.

Claim—My improvement in the manufacture of india rubber or gutta percha hose or tubing, which consists in impregnating the fibrous fabric which forms the bases thereof with protective or preservative substances, and subsequently coating with india rubber or gutta percha, and forming the same into hose or tubing.

342. STEELS; T. J. Mayall, Roxbury, Massachusetts.

Claim—A "steel" or implement for sharpening table-knives, &c., formed of india rubber or gutta percha, with which emery, sand, or other suitably gritty substances, are incorporated.

343. MANUFACTURE OF PACKING AND TUBING; T. J. Mayall, Roxbury, Massachusetts.

Claim—My new method of forming packing hose or tubing, and other similar articles, the same consisting in rolling or wrapping the fabric to be used around the core or mandrel, by rolling or passing said core or mandrel and the fabric or wrapper together between two surfaces, one of which exerts a self-adjusting yielding pressure upon the article to be formed, while the other surface has the necessary motion imparted to it, to roll or wind the fabric used around the cord or mandrel.

344. STEAM PLOUGHS; A. E. and S. N. McGaughey, Wastedo, Minnesota.

Claim—1st, The ploughs, attached to radial arms or oscillating shafts, and arranged with the pinions, racks, ratchet toothed hubs, and stop-rods, to operate as set forth. 2d, In connexion with the ploughs, arranged and operated as described, the rakes or harrows attached to the bars, for the purpose specified.

345. MEANS FOR CLIMBING TELEGRAPH POLES; J. H. McNeely, Indianapolis, Indiana.

Claim—The combination and arrangement of the hooks with the loops and set-screw, constructed as set forth.

346. CUT-OFF APPARATUS FOR STEAM ENGINES; Reuben Miller, Pittsburgh, Pennsylvania.

Claim—The employment, in combination with the tappets for opening the valve, to effect induction of steam, of the collars attached to the same valve rod, and the tappet levers with independent arms, said collars and tappet levers being applied and operating to effect the cutting off the steam at such point in the stroke of the piston, as may be desired.

347. RAILROAD CARS; John Miner and Silas Merrick, New Brighton, Pennsylvania.

Claim—Inserting strips of wood between the angle iron which forms the framework of the car, in combination with panel plates formed of a single piece of iron struck up, whether plain or ornamented. Also, constructing the ribs and framework of the car of two strips of L iron, with a bar of wood interposed, when these irons and the wood are united by rivets.

348. GRAIN SEPARATORS; J. R. Moffitt, Piqua, Ohio.

Claim—In combination with a reversible spout adapted to discharge grain at either end of a separating machine, the screen, placed within or above the said spout, and operated by the motion of the shoe, for the purpose of screening grain after the action of the winnowing apparatus.

349. CAR TRUCKS; F. I. Palmer, Knoxville, Tennessee.

Claim—The arrangement and combination of the bars, as set forth.

350. PAPER FILES; J. J. Parker, Marietta, Ohio.

Claim—The combination with the hinged book-back of bars, springs, and rods, arranged in the manner described.

351. MANUFACTURE OF HOLLOW MOULDED RUBBER GOODS; Dubois D. Parmelee, Salem, Assignor to John A. Greene, Beverly, Massachusetts.

Claim—The method described of shaping the said articles in moulds preparatory to their being vulcanized or hermized, that is, treated in the cold way by any known process, by applying heat to bags made of india rubber, its equivalent, or their compound, free from sulphur and inflated with air, so as to snugly fit the moulds, in the manner set forth.

352. TWINE SPOOLS; Francis A. Parmelee, New Haven, Connecticut.

Claim—The combination of the double spool with the spindle, as described.

353. COTTON-PICKER'S WALLETS; G. H. Peabody, Columbus, Georgia.

Claim—Applying a sponge, or other equivalent device, to a cotton-picker's wallet, for the purpose of enabling the picker to readily moisten his fingers, and thus facilitate his work.

354. PLOUGHS; Simeon F. Peck, Pennfield, Georgia.

Claim—The manner of attaching the share to the foot-bar, to wit: having the back part of the share notched and fitted in a rebate in the foot-bar, and receiving the shoulder formed by the rebate, while the ends of the share fit underneath the projections, and the lever is pressed on the outer side of the share by means of the wedge.

355. PROPELLER AND PADDLE-WHEEL SHAFT; William Peters, Baltimore, Maryland.

Claim—A propeller or paddle-wheel shaft, constructed as set forth.

356. WHIFFLETREE HOOKS; S. M. Perkins, Albany, Illinois.

Claim—1st, The combination of the stud with a revolving spring button, arranged as described. 2d, In combination with a revolving spring button, I claim a stationary stop, so arranged as to prevent the eye of the trace in all positions from passing over the buttons. 3d, The combination of the spiral spring, the projecting stud, and the inner stop, arranged as described. 4th, Constructing the button with the hooded end, as described.

357. CHAIN CABLE STOPPER; Charles Perley, City of New York.

Claim—The bridge over the chain, in combination with the cable-stopper, for the purpose of forcing the chain into said stopper, in the manner specified.

358. HORSE RAKES; Gideon Pierce, Ercildown, Pennsylvania.

Claim—The arrangement of the cog-wheel, rack, lever, frame, bar, standard, and teeth, as set forth.

359. HORSE HAY RAKES; Matthias Reaser, Reading, Pennsylvania.

Claim—The combination of the rock shafts, clearers, teeth, brace guides, spring bar, pins, and springs, with the draft-bar, arranged in the manner described.

360. LAMPS; Charles W. Richter, Madison, Georgia.

Claim—The use of the wick-adjuster, formed of the bar, with a toothed plate at its inner end, and so arranged as to have a certain degree of longitudinal adjustment in relation with the wick.

[This invention relates to an improvement in that class of lamps which are designed for burning those hydro-carbons that volatilize and glassify at a low temperature, such, for instance, as a combination of turpentine and alcohol, generally known as "burning fluid," the light or spirituous coal oils, &c.]

361. CATCH-BOLT; William Salisbury Wheeling, Virginia.

Claim—The use of the lever, combined and arranged with the catch-bolt, to operate as set forth.

362. CULTIVATOR TEETH; Henry Sanders, Utica, New York.

Claim—The flanches, a a, and semicircular projection on the tooth, and the flanches, c c, and pin on the chair, arranged as described.

363. COOKING STOVES; Samuel Smith, Philadelphia, Pennsylvania.

Claim—1st, The grate, having hollow bars communicating with each other, and arranged in respect to the hollow back and its zigzag passages, as set forth. 2d, The plates of the grate, arranged so as to serve the double purpose of connecting the bars of the grate together, and forming a chamber for heating the air preparatory to the same being discharged in jets into the front of the fire.

364. WATER-HEATER FOR STEAM ENGINES; James Speers, West Manchester, Pennsylvania.

Claim—1st, The arrangement of the float, lever, valve, partition, and pipes, b c and x, for the purpose of constructing water-heaters for supplying the force pumps of steam engines with heated water. 2d, The use of the branch pipe, x, in connexion with pipe, c, and valve.

365. PIANO-FORTES; Henry Steinway, Jr., City of New York.

Claim—The employment, in combination with the agraffs, of the projection, on the underside of the plate, lapping over and abutting against the edge of the turning block.

366. VALVE GEAR FOR STEAM ENGINES; David Stoddard, San Francisco, California.

Claim—The use of the fixed cam, in combination with the adjustable cam and the rocking bar, which is connected to the cam rod, and also connected to, and operated by, the cam yokes.

367. SHINGLE MACHINES; J. E. Sturdy, Augusta, Maine.

Claim—The use, in connexion with the shingle-sawing machine described, of the guides attached to the bolt carriage, and actuated alternately to perform their proper function to the planer.

368. RAILROAD CAR COUPLINGS; Joseph R. Swift, New Orleans, Louisiana.

Claim—The combination of the peculiarly constructed draw head with the peculiarly constructed elbow-shaped gravitating lever hook.

369. METAL STRINGS FOR PIANOS, &c.; J. B. Thompson, Philadelphia, Pennsylvania.

Claim—The employment, for the strings of piano-fortes, and other musical instruments, of hardened and tempered steel wire.

370. APPARATUS FOR ELEVATING WIRE; S. H. Swift, Morrisville, Vermont.

Claim—The bucket, curved at the rear, in combination with the trunnions, band, notched flanched wheel, roller, and frame, constructed in the manner set forth.

371. COMPOSITION FOR MAKING SOAP; George W. Tolhurst, Liverpool, Ohio.

Claim—A soap compound, prepared of the ingredients proportioned in the quantities hereafter mentioned, viz: five ounces common bar soap, four ounces sal soda, half ounce borax, half drachm of sugar, burned, and one teaspoonful of linseed oil; add as much rain water as to make a soap of suitable consistency; after it is boiled, it is ready for use.

372. RAILROAD CAR BRAKES; Alfred F. Toulmir, Ellicott's Mills, Maryland.

Claim—The mode described of simultaneously applying or putting down brakes by means of the brake cord, the box spring, the crank lever, the trigger, the cross-piece, the slide, and the swivel bar, with its springs, arranged as described. Also, the mode described of instantaneously freeing, relieving, or raising the brakes, and of keeping them free when raised, until the conductor, engineer, or brakesman shall desire to apply them, by means of the forward or tractive movement of the train, in combination with the slide, the cross-piece, and the trigger, with its shoulder.

373. STOVES; John G. Treadwell, Albany, New York.

Claim—The arrangement of the stove, flue, B, door, flue, D, and smoke-pipe, when the flue, B, is secured to, or made a part of, the underside or bottom of the stove.

374. COMPOSITION FOR SOLES AND HEELS OF SHOES AND BOOTS, VENEERS, PACKING, AND OTHER PURPOSES; Henry George Tyer, Andover, Massachusetts.

Claim—A composition made of vulcanized india rubber, leather, and gutta percha, in the proportions and manner set forth.

375. LAMPS; I. T. Vankirk, Frankfort, Pennsylvania, and Wm. M. Fulton, Granberry, New York.

Claim—The spindle with its cog-wheels, the said spindle being confined to its place by, and acted upon by a spring attached to the wick tube, and arranged in respect to the latter, as set forth.

376. GRAIN SEPARATORS; D. S. Wagener, Penn Yan, New York.

Claim—The case, with its flanches or divisions, surrounding distributor or sheath, for distributing the grain in a circular form within said case, and separating the impurities from the grain at said point by means of a suction and blast fans, or by a suction or blast fan, operating as described.

377. ROCKING CHAIR; John H. Wells, Brooklyn, New York.

Claim—The arrangement described of the legs, the hinge joint connecting the seat with the underwork and the springs.

378. MACHINES FOR CLEANING ANIMALS; Calvin D. Wheeler, City of New York.

Claim—Arranging and combining with a portable case or frame, a rotating comb and brush.

379. CANAL LOCKS; C. W. Williams, Port Jervis, New York.

Claim—1st, The arrangement of the sliding shaft, gearing, sliding rack, rods, wickets, and gate, applied to a canal lock. 2d, The employment of guard-strip applied to the gate, and arranged as set forth.

380. MACHINE FOR DRAWING BOLTS; Seth Wilmarth, Charlestown, Massachusetts.

Claim—The combination and arrangement of the several parts specified.

381. GRAIN SEPARATORS; William Wilmington, Toledo, Ohio.

Claim—1st, The combination of the endless belt, the dividing board, and the rotary reciprocating bars, the belt being separated from the bars by means of the board, used for delivering the straw and unseparated grain to the bars and its turning point. 2d, The combination of the teeth on the underside and end of the bars with the fingers or comb.

382. MACHINE FOR SHAVING BARK; Martin Winger, Lancaster County, Pennsylvania.

Claim—The combination of the convex traveling bed with the rotary knives and pressure rollers.

383. MOVING LOCOMOTIVE ENGINES BY HAND POWER; John E. Wootten, Philadelphia, Pennsylvania.]

Claim—The application of the hydraulic piston to the purpose of propelling a locomotive engine or railroad car upon the track, by its direct action upon the periphery of the wheel, combined with the peculiar arrangement of the plunger in reference to the piston, whereby the latter is caused to advance and recede in concert with the plunger by the aid of atmospheric pressure, and without the intervention of valves.

384. BLIND-FASTENER; Oscar M. Andrews, Assignor to A. K. Seymour, Hecla Works, New York.

Claim—The arrangement on the side of the frame of a shutter or blind, and a rotary wedge-shaped cam, in combination with a hook, fastened in the manner specified.

385. CAN BOTTOMS FOR ROVING; George Bradley, Assignor to Jacob S. Rodgers, Paterson, New Jersey.

Claim—So mounting two or more can bottoms, that the filled can may be removed from under the coiler, and an empty one substituted in its place, by means, simply, of a partial rotation of the frame.

386. MOULDING FOR METAL CASTING; John P. Broadmeadow, Assignor to self and Albert Eames, Bridgeport, Connecticut.

Claim—The combined use of a half flask of a sufficient size to hold the quantity of loose sand required to form a half mould, and of a follow board, small enough to enter the said half flask and act as a piston to compress the sand therein, when pressure is applied. Also, the combined use of a half flask, as above described, and of a strike whose profile corresponds in form with the transverse section or profile of the pattern. Also, the combined use of a half flask, as above described, constituting the cope of a ribbed cope plate fitted to enter therein, and of sustaining pins in the said cope. Also, the combined use of the aforesaid cope plate, of a button plate fitted to enter the drag of the flasks, and of clamps. Also, combining the sprue pattern with the follow board, when this combination is used in connexion with a match-board having an opening to permit the descent of the lower end of the sprue pattern. Also, the combination of projections or indentations, or both, with the follow board, in contradistinction to constructing the flasks with projections and indentations.

387. HOLDING KNIFE-HANDLES FOR SOLDERING; Almon Cooley, Assignor to E. W. Sperry, J. H. Ashmead, E. Hurlbut, and Henry E. Robbins, Hartford, Connecticut.

Claim—The described device for holding knife-blades, handles, &c., for soldering together, the rods, cap, bar, and springs, operating in the manner set forth.

388. HOLDING KNIFE-HANDLES FOR SOLDERING; Almon Cooley, Assignor to E. W. Sperry, J. H. Ashmead, E. Hurlbut, and Henry E. Robbins, Hartford, Connecticut.

Claim—The device for securing or holding handles (formed of two parts,) for soldering; the adjustable yielding clamps or brackets, described; the combination of the yielding clamps or brackets with a turn-table, in the manner described.

389. WASHING MACHINE; Thomas Harvey, Assignor to self and David Kramer, Wooster, Ohio.

Claim—The combination of the two vertical movable plates with the inclined planes, and the fixed, perforated, corrugated partition, arranged as described.

390. PANS FOR EVAPORATING SUGAR JUICE; Wheeler Hedges, Assignor to self and P. W. Gates, Chicago, Ill.

Claim—1st, The arrangement of the pipes, E E, with the pipe, F, in pan, so that the application of steam to the pipes, E E, will cause the greatest ebullition, and the foam to raise highest longitudinally in the middle of the pan, for the purpose of causing all impurities to be deposited upon the flaring sides of the pan. 2d, The construction and application of a defecator, in combination with the evaporator. 4th, The stop-boards, in combination with the evaporator, as described.

391. RETORTS FOR DISTILLING COAL OIL; Mathew Hodkinson, Assignor to Mathew Hodkinson, Jr., Pittsburgh, Pennsylvania.

Claim—The stationary retort with a shaft armed with knives, whose edges are at right angles with the shaft passing through it, by which, when motion is given to the shaft, the coal is broken and pulverized more effectually and more economically than by any other method.

392. NURSING BOTTLES; Francis J. La Forme, Boston, Massachusetts.

Claim—The improved nurse bottle, or one having an elastic tube, applied thereto in the manner set forth.

393. Machine for Manufacturing Ruches; Daniel Penman and Elisha Fitzgerald, Assignors to William C. Walker and M. Penman, City of New York.

Claim—The pressing bar, attached to the shaft by the arms (said arms having a crank) at its end, in combination with the adjustable gauge bar, hook rods, and treadles.

394. Boot and Shoe Tip; Newman Silverthorn, Prescott, Wisconsin, Assignor to James M. Allen, Fredericktown, Ohio.

Claim—A boot or shoe tip, made of any of the known preparations of india rubber or gutta percha, and to be applied to the boot or shoe, in the manner described.

Extensions.

1. Vault Covers; Thaddeus Hyatt, City of New York; patented Nov. 12, 1845; re-issued April 3, 1855; extended Nov. 8, 1859.

Claim—Making them of a metallic grating or perforated metallic plate, with the apertures so small that persons or bodies passing over or falling on them may be entirely sustained by the metal; but this I only claim when the apertures are protected by glass. Also, in combination with the grating or perforated cover and glass fitted thereto, the knobs or protuberances on the upper surface of the grating or perforated plate, for preventing the abrasion or scratching of the glass.

2. Forges; Christian V. Queen, Peekskill, New York; patented Nov. 18, 1845; extended Nov. 22, 1859.

Claim—The combination of the curved sliding shutters for enclosing the space over the fire, and the device for admitting a draft of air to keep up the combustion during the intervals in which the bellows are not employed.

3. Planing Machines; Joseph E. Anderson, Boston, Mass.; patented Nov. 21, 1845; extended Nov. 22, 1859.

Claim—The manner shown of forming, arranging, and combining with the revolving cutter wheel, the revolving platform and the endless aprons between which the board to be planed is to be passed, by means of which arrangement and combination it is firmly held along the whole length of such apron, and carried regularly forward without deviation.

4. Magnetic Water Gauge for Boilers; George Faber, Canton, Ohio; patented Nov. 26, 1845; extended Nov. 22, 1859.

Claim—The method described of indicating the rise and fall of water in a steam boiler or generator by means of an indicator outside thereof, actuated by a magnet connected with a float or any other body within the boiler that rises and falls with the water, and connected with the magnet.

Additional Improvements.

1. Gold-washer; Mortimer Nelson, City of New York; patented Oct. 4, 1859; additional dated Nov. 8, 1859.

Claim—1st, Imparting to the shaft and the series of pans thereon, an intermittent or oscillating movement; and in combination with the shaft and pans having the intermittent or oscillating movement set forth, I claim the cam and bail to give the vertical or jigging movement. 2d, The conical hoods or funnels in combination with the pans.

2. Apparatus for Watering and Sweeping Railroads; Wm. C. Allison, Assignor to self and John Murphy, Philadelphia, Pennsylvania; patented December 18, 1849; additional dated Nov. 15, 1859.

Claim—Combining a fire-place and flues, or their equivalent heating apparatus, with the water tank, for the purpose specified.

3. Naval Architecture; Benjamin F. Wells, Georgetown, D. C.; patented October 18, 1859; additional dated Nov. 22, 1859.

Claim—Making the lines of every section of a vessel, from the keel to the water-line, arcs of circles, when said arcs have separate and independent centres determined in the manner described.

4. Straw Cutters; W.W. Hollman, Eddyville, Ky.; patented March 30, 1858; additional dated Nov. 29, 1859.

Claim—The combination and arrangement of the devices for operating the knife and feeding-box as described.

Re-Issues.

1. Machines for Cleaning Grain; William M. Griffith & Co., Assignees of William H. Orr, Martin's Ferry, Ohio; patented July 13, 1859; re-issued November 1, 1859.

Claim—The arrangement and application of the stirrer in the described relation to the riddle or shoe of a grain separating machine, operating in the manner set forth.

2. Revolving Fire Arms; E. K. Root, Hartford, Conn.; patented Dec. 25, 1855; re-issued Nov. 1, 1859.

Claim—Combining the driving-pin that works in the grooves to rotate and hold the breech in line with a slide below adapted to the reception of and to be operated by the trigger-finger, and acting on the lock on the end of the back motion, to liberate the cock or hammer and discharge the load. Also, combining the plunger with the many-chambered rotating breech pistol or other fire arm, by means of a lever with a cogged sector engaging the cogs of a straight rack, substantially as and for the purpose specified.

3. Straw-Cutters; De Witt C. Cummings, Fulton, New York; patented Aug. 7, 1855; re-issued Nov. 8, 1859.

Claim—1st, Operating the adjustable lower feed-roller by means of a spur-wheel hung in a vibrating frame or yoke, the axis of which is connected with the said roller by means of an universal coupling, when said roller is supported on spring bearings independent of each other. 2d, The employment of a cylinder provided with a knife or knives which have an upward cylindrical cut arranged with two independent feed-rollers, the lower one of which being supported on a spring or springs in such a manner that it can be adjusted to act with greater or less pressure on the material to be cut.

4. Pumps; Wm. M. Henderson, Baltimore, Md.; patented Oct. 4, 1859; re-issued Nov. 8, 1859.

Claim—The two ball valve cages with the suction valves in their interior, attached to the extremities of a central perforated tube or its equivalent, in combination with the water ways and discharge valve or valves; the water entering between the plunger-valves and alternately discharged from the ends of the pump barrel in direction of the stroke.

5. Lock and Detector; John H. Lyon, City of New York; patented Sept. 13, 1859, re-issued Nov. 8, 1859.

Claim—Combining with a padlock, or any lock provided with a shackle, a lead or soft metal tube or seal, so arranged as to be temporarily secured thereto and admitting of being released only by the removal or breaking of said tube or seal, which thereby serves as a detector.

6. Rim for Lockets; Charles G. Bloomer, Wickford, Rhode Island; patented April 28, 1857; re-issued Nov. 15, 1859.

Claim—A rim for lockets and similar metallic cases, formed of sheet metal, in such manner that the face of the field-piece within the case and the exterior surface of the rim, are both formed from the same side or surface of the original sheet metal, and that the field piece and rim are of one piece of metal.

7. Mode of Constructing Lockets; Charles G. Bloomer, Wickford, Rhode Island; patented April 28, 1857; re-issued November 15, 1859.

Claim—The method of imparting the finished shape to case rims of sheet or thin metal, in which the external ring and field-piece are one piece of metal, by means of dies.

8. Machine for Wetting and Cutting Paper for Printing Presses; Moses S. Beach, Brooklyn, New York; patented August 25, 1857; re-issued November 15, 1859.

Claim—1st, The combination with the printing machine of the mechanism described, so arranged that the paper, as it passes along from the reel to be printed upon, shall be dampened. 2d, The combination, with the cylinders, c d, of the adjustable rollers, e f, to supply the moisture for the paper, and also to regulate the quantity of that moisture. 3d. The combination with the printing machine of the moisture vessels. 4th, The combination of the cutting knife with the dampening roll-cylinder. 5th, Simultaneously wetting or moistening both sides of the paper, in the manner described. 6th, Leaving the paper dry at the point or line of cutting. 7th, The employment of a spring pressure to project the knife, in the manner described. 8th, Retiring the knife within circumference of the cylinder, by means of the cams. 9th, Catching the knife, when retired within the circumference of the cylinder, c, retaining it while so retired, and releasing for the operation of cutting by means of the catches, the springs, and the tripping pins. 10th. The employment of cylinders, c d, to draw the paper from the reel, to be afterwards cut into sheets, and fed into the printing machine. 11th, Breaking or tearing asunder any fibres of paper left uncut by the knife, by the grasp of the cylinder, m, and roller, q. 12th. Giving the conducting or guide tapes a speed greater than that of the paper. 13th, The combination of the feeding mechanism, cutting apparatus, and the printing machine, in the said combination for feeding the paper from a roll to a printing machine, and cutting, or partially cutting, it into sheets as it passes along to be printed.

9. Bending Wood; Thomas Blanchard, Boston, Massachusetts; patented December 18, 1849; re-issued Nov. 15, 1859.

Claim—My improved method of bending wood, as described.

10. Apparatus for Cooling Liquids; Berresford Maria King, executrix of Valentine Hall, deceased, City of New York; patented Sept. 20, 1859; re-issued Nov. 22, 1859.

Claim—1st, The employment or use of one or more receivers, with or without the pump, placed on a tank containing ice water or water at a low temperature, and connected together and to the liquid supply pipe as set forth. 2d, The employment or use of one or more receivers, placed within a tank, and connected with the barrel or cask by means of a siphon, and with a pump within or at the outer side of the tank, for the purposes set forth. 3d, The combining of a pump with one or more receivers connected together and made to communicate with each other by siphons, when said parts are submerged within a tank, and made to communicate with the barrel or cask by means of a siphon extending over the top of the tank.

11. Machines for Ploughing; Jos. W. Fawkes, Christiana, Pennsylvania; patented Jan. 26, 1858; re-issued November 22, 1859.

Claim—1st, The employment, in combination with the locomotive, of a bilge-shaped driving-wheel. 2d, I do not claim broadly the invention of movable spurs, but I claim the combination of the sliding spurs with the bilge-shaped driving-wheel, as described. 3d, The arrangement of the adjustable frame, ploughs, gauge-wheel, driving-wheel, engine, boiler, and guiding-wheels.

12. Running Gear of Locomotive Engines; Septimus Norris, Philadelphia, Pa.; patented Sept. 26, 1854; re-issued March 2, 1858; re-re-issued November 22, 1859.

Claim—The combination of a free vibrating truck, with six or more driving-wheels, when the front pair of drivers is placed in advance of the centre of gravity of the entire engine, as set forth.

13. Steam Boilers; William Oldham, Buffalo, New York; patented June 7, 1859; re-issued Nov. 22, 1859.

Claim—1st The central water space in the combustion chamber, arranged in relation to the annular water space and to the tubes or their respective equivalents, as set forth. 2d. Placing the annular sheet, and horizontal plate (which with the jacket form the smoke-pipe,) outside of the water space, to allow the sediment to be conveniently removed from the water space, in communication with the described arrangement of the return tubes.

14. Making Brass Kettles; O.W. Minard, Waterbury, Conn.; patented April 15, 1856; re-issued Nov. 29, 1859.

Claim—The employment of two rotating rollers, for griping, turning, and rolling the disc of metal, in combination with the clamps or holders for holding the disc of metal at any desired angle with the axis of the rollers. Also, the concave and convex clamping plates in combination with the rollers or any equivalent mode of rolling the metal. Also, in combination with the rollers for rolling the disc of metal, the supporting rest for supporting the metal beyond the point of action of the griping rollers.

15. Reaping and Mowing Machines; Jeremiah W. Mulley, Amsterdam, New York; patented Feb. 10, 1857; re-issued Nov. 29, 1859.

Claim—So constructing and arranging the platform of a reaper as that it, or a portion of it, may be made to form a track-clearer when it is desired to convert the machine into a mower.

16. Reaping and Mowing Machines; Jeremiah W. Mulley, Amsterdam, New York; patented Feb. 10, 1857; re-issued Nov. 22, 1859.

Claim—The hollow reel-shaft made of sheet metal or its equivalent, formed with boxes or bearings at or near each end, and made to revolve on an arm supported at one end only.

17. Reaping and Mowing Machines; Jeremiah W. Mulley, Amsterdam, New York; patented Feb. 10, 1857; re-issued Nov. 29, 1859.

Claim—1st, The manner described of securing the detachable cutters or blades to or in their place on the cutter-bar, and relatively to each other, by means of central holding screws in combination with pins

or studs on the bar, to fit the recesses in the adjoining sides of the blades. 2d, Providing the fingers with the laterally projecting lips in front and rear of the slot in which the cutter-bar plays. 3d, The finger-bar arched as described in combination with the fingers made with a swell or convex projection in their rear.

DESIGNS.

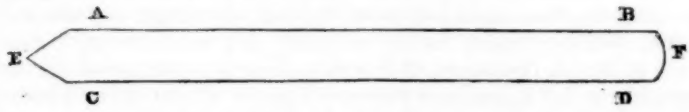
1. CLOCK CASES; Charles T. Foot, Bristol, Conn.; dated November 1, 1859.
2. TRADE MARK; Thomas and Samuel Hardgrove, Richmond, Va.; dated November 1, 1859.
3. BASE FOR CASTERS; Allen Leonard, Hartford, Conn.; dated November 1, 1859.
4. CASTER HANDLES; Allen Leonard, Hartford, Conn.; dated November 1, 1859.
5. FORK OR SPOON HANDLES; William H. Lewis, Glastenbury, Conn.; dated November 1, 1859.
6. STOVES; Garretson Smith and Henry Brown, assignors to Cox, Whitman & Cox, Philadelphia, Pa.; dated November 1, 1859.
7. CARRIAGE BODIES; Harrison Grosh, Litiz, Warwick Township, Pennsylvania; dated Nov. 15, 1859.
8. CARPET PATTERNS; Elemir J. Ney, assignor to the Lowell Manufacturing Company, Lowell, Mass.; dated November 22, 1859. (2 cases.)
9. FLOOR CLOTHS; J. B. Virolet, assignor to John W. Hoyt, City of New York; dated Nov. 29, 1859.

MECHANICS, PHYSICS, AND CHEMISTRY.

*Method of obviating the effect produced by Currents in Telegraph Wires induced by Terrestrial Currents.** By H. W. ELPHINSTONE.

A B, C D, are two similar telegraph wires, parallel to each other, separated by a small space; at F they communicate with the two ends of the helix of a galvanometer F; at E there is a commutator, by means of which the two telegraph wires can be put in contact with each other, or be joined respectively to the poles of a battery.

Suppose the two wires to be in contact with each other; let there be a terrestrial current which induces a current in A B sufficient to cause a deviation d in the galvanometer at F, the same current will induce a current in C D which will produce a deviation d' in the galvanometer at F. But since these two currents enter the helix at its opposite ends, d and d' have opposite signs; the total deviation is $d-d'$, a quantity that will generally be small.



Now, by means of the commutator, place the battery in circuit, and let the deviation produced by the battery be D; the induced currents remain the same as before; the total deviation will be $D + d - d' = D$ nearly.

If in practice $d-d'$ could be rendered so small as not to be comparable with D, there would be no need of keeping the ends of the telegraph wires in contact when the battery is out of circuit; it would be sufficient to insulate them, so as to prevent any extraneous current passing by accident through the wires. If $d-d'$ could not be rendered small enough to be neglected, it would, at all events, be smaller than d, which is the deviation under the present system. And it would not, I think, be impossible to distinguish the battery signal by a previous arrangement having been made by the operators to send battery signals at constant intervals of time, every 10 seconds for instance, reading off immediately before and after the signal was transmitted.

* From the Lond. Ed. and Dub. Phil. Mag., Nov., 1859.

*On Platinized Graphite Batteries.** By C. V. Walker, Esq., F.R.S., F.R.A.S, &c. Received January 4th, 1859.

In a short note communicated to the Royal Society on March 9th, 1857, and which was read on March 19th, reference was made to the voltaic combination that I had adopted for certain telegraphic purposes; namely, zinc-graphite. Graphite in its crude state had for some years been of great service to me, especially for batteries whose resting time is great in proportion to their working time. Since the date of that notice, I have considerably increased the value of graphite for electrical purposes by platinizing it according to the process first described by Mr. Smee, whose platinized silver battery has been long known and much used. The material to which I refer by the term "Graphite," is the crust or corrosion that is collected from the interior of iron gas retorts that have been long in use.

My first crude graphite battery of twelve pairs of plates was set up on April 5th, 1849, for working the telegraph from my residence at Tonbridge to the Telegraph Office, about a mile distant. It was charged with sand saturated with diluted acid; and had not been dismounted in March, 1851, when I changed my abode. During the interval, the sand was from time to time moistened with acid water or water only. The plates in this case had been roughly chipped out and rubbed on stone into something like shape. In the mean time I had some sets of plates cut at the Locomotive Works, Ashford, and was thus enabled to obtain further results. I forwarded a graphite battery to the Great Exhibition in 1851, for which a prize medal was awarded. The introduction of graphite into any thing like general use was for a long period no easy matter, on account of the difficulty of finding any one who would undertake to cut it into plates, its hardness destroying the tools; and the then limited demand did not encourage any one to construct special machinery for the purpose. My wants at length reached the ear of Mr. J. Robinson, of Everton, Liverpool, who took the matter thoroughly in hand, and has succeeded perfectly in cutting plates into any form and to comparatively any size, at a very moderate cost, for which I am much indebted to him. I have before me plates 12 inches $\times$ 10 inches, of smooth texture and uniform thickness, and have seen some of double that size.

The plates in common use for bell signals are $7\frac{1}{2}$ inches $\times$ 3 inches and $\frac{3}{8}$ inch thick, of which about 2000 are in daily use on the South-Eastern Railway, and the greater portion of these are now platinized. The plates are delivered to me in their crude state, that is to say, they are merely cut into form. Immediately on arrival they are placed in a stone pan, and covered with a mixture of 1 sulphuric acid +4 water, in which they are allowed to remain for three or four days or more. They are taken out as required, and are washed under a tap of running water; this operation dissolves out any foreign matter that might be pernicious in a voltaic combination wherein sulphuric acid was employed; they are then partially dried. A hole for a rivet is next drilled in the middle, near the top of each plate—a belt of var-

* From the Proceedings of the Royal Society, No. 34.

nish one inch wide is applied to the top on both sides of each plate—a blank one inch square, having the rivet hole for its centre, being left unvarnished on each side—electrotype copper is then deposited on the blank square in the usual way. The deposited metal is then tinned, no part of the copper being left bare; a connecting slip of copper, 6 inches × 1 inch, is prepared and also entirely tinned; this is riveted to the graphite plate with a copper rivet, also tinned. The soldering iron is now applied, and a little solder run in between the two surfaces. By thus protecting all the exposed copper with tin, the formation of sulphate of copper and its attendant inconveniences are prevented. The plate is now platinized.

A mixture of 1 sulphuric acid + 10 water is placed in a vertical glass cell, to this are added a few crystals of chloride of platinum till the solution presents a faint straw color. The battery power employed for platinizing is three cells of platinized graphite and zinc. The positive electrode is platinum or graphite itself, and is presented to both sides of the plate that is to be platinized. The action is allowed to go on for about twenty minutes. Each finished plate is tested as to its power of liberating the hydrogen of electrolysis, by placing it in acid water in contact with an amalgamated zinc plate.

I have drawn out the above description in the presence of our assistant, who attends to this department of the telegraph establishment, in order to be correct in the small details.

The battery-cells for the plates above described are quart jars of stone-ware that resists acid. The exciting solution is 1 sulphuric acid + 8 to 12 water. Zinc plates are riveted to the other end of the copper connecting slip, also with tin rivets. The zinc is strongly amalgamated. It is dipped in a vessel containing 1 sulphuric acid + 4 water, and after a few seconds, more or less, is withdrawn and thrust in its then condition into a trough of mercury, and set aside to drain. On the following day it is treated in a similar manner. When the batteries are being put together, and before the zincs are placed in the jars, the foot of each is placed in a trough or slipper of gutta percha, 3 inches by ¼ inch, containing about a couple of ounces of mercury. A battery thus carefully prepared will stand for an indefinitely long period with little perceptible waste, and be ready for use at all times. Under ordinary circumstances it is not necessary to dismount the batteries employed for telegraph signaling more than once a year. Mercury is added during the interval, and the jars are filled up as occasion requires. The greater portion of the mercury is recovered: when old plates come home, a considerable quantity of rich amalgam is scraped from the plates; this is placed in jars of acid water, and a few pieces of graphite are thrown in; the electro-chemical action makes the amalgam poorer of zinc, and mercury is easily expressed. By continuing the operation, more mercury, to the amount in all of nearly three-fourths, is recovered.

As an illustration of the economic importance of this material in applied science, I am informed that the silver plates of the batteries constructed for the Atlantic Telegraph cost £2520 or more. On my having directed the attention of the Company to graphite as a substi-

tute for silver, a set of plates were ordered, equal in number and size, which were supplied (furnished with electrotype copper and connecting wires) for £216.

TABLE I.—*Electro-magnet; 10 yards No. 16 wire.*

12 cells in series.				12 cells in double series of 2 sixes.			
Resistance.	Silver.	Graphite.	Graphite.	Resistance.	Silver.	Graphite.	Graphite.
yds.	lbs.	lbs.	lbs.	yds.	lbs.	lbs.	lbs.
10	14·75	14·00	15·00	10	22·50	20·50	20·00
147	10·00	12·50	9·00	147	14·00	10·00	9·00
284	7·00	9·00	8·00	284	8 25	7·00	7·00
421	6·00	7·00	6·00	421	5·00	5·00	4·00
558	5·00	5·00	4·00	558	3·25	3·00	2·50
695	4·50	3·00	3·00	695	2·00	2·25	1·50
832	3·00	2·50	2·50	832	2·00	1·50	1·25
6 cells in series.				6 cells in double series of 2 threes.			
10		12·25	10·00	10	14·00	14·00	14·00
147	9·00	6·25	7·00	147	4·00	4·00	5·00
284	5·00	5·00	4·00	284	2·50	2·25	2·50
421	3·50	4·00	2·50	421	2·00	1·75	2·00
558	2·25	2·00	2 00	558	1·50	1·25	1·00
695	2 00	1·50	1·00	695	1·00	1·00	1·00
832	1·50	1·25	0·75	832	0·75	0·75	0 75

TABLE II.—*Electro-magnet; 274 yards No. 16 wire. 12 cells in series.*

Resistance.	Silver.	Graphite.	Graphite.
yards.	pounds.	pounds.	pounds.
137×2	14·00	18·00	22·50
137 3	12 75	15·75	14·00
137 4	10·00	13·00	11·00
137 5	9·00	12·50	11·00
137 6	9·00	10·75	11·00
137 7	9·50	9·50	9·00
137 8	8·75	9·50	8 75
6 cells in series.			
137×2	9·75	12·75	11·00
137 3	8·00	10·75	10·00
137 4	7·25	10·00	9·50
137 5	7·75	9·00	9·00
137 6	7·00	8·00	9·00
137 7	6·75	9 00	8·75
137 8	7·00	8·75	8·00
6 cells in double series of 2 threes.			
137×2	8 75	10	11·00
137 3	7·25	9	9·00
137 4	6·00	9	9·00
137 5	7·75	8	7·00
137 6	4·25	6	5·00
137 7	4·00	6	4·75
137 8	4·25	5	6·00

The foregoing Tables illustrate the effective working powers of platinized graphite, as compared under like circumstances, with platinized silver, given in lifting powers in pounds. A third column is added, giving the results when table salt is dissolved in the water employed with the graphites.

In all the above experiments the cells were charged with 1 sulphuric acid + 13 water (salt water in the third column); and 13·5 square inches of surface were immersed. The silver-zinc pairs were 1 inch apart, the graphite-zinc, 2 inches. The lifting powers were not read off more closely than to quarter-pounds. The electro-magnet used in Table I. was a small horse-shoe containing about 10 yards of No. 16 wire; that used in Table II. was one of the electro-magnets used in the construction of the signal bells before described (*vide* Proc. Roy. Soc., vol. viii. p. 419), and containing 274 yards of No. 16 copper wire. The resistance added in each successive experiment was one bobbin of a similar electro-magnet or 137 yards of wire. The resistances in the Table include the resistance of the electro-magnet. The total resistances in Table II. are all multiples of the contents of a single bobbin or 137 yards. A glance from left to right on the same horizontal line shows the comparative value of each combination in the several experiments. One or two small irregularities in Table II. in the six-cell results, are doubtless due to the poles of the magnet not having been ground true.

With respect to durability, the graphite plates in use since 1850 are in as good condition as the new ones now in course of manufacture. Silver plates employed by us under like circumstances, commenced perishing after twelve months or more of use; they crumble away in great measure, they cut apart at the surface level, and they get eaten into holes throughout.

To Prof. J. C. Cresson, Pres. Franklin Institute.

Dear Sir:—I enclose the within extract from the San Francisco "*Bulletin*" newspaper, of the 1st inst. The existence of a belt of ocean whose waters contain boracic acid in appreciable quantity, and extending along the entire coast of California, is an interesting fact to scientists—and I send the publication of the fact for any use you may please to make of it.

The analyses of Dr. Veatch on this subject, have been made most carefully, and are entitled to entire credit.

San Francisco, Cal., December 3, 1859. Lewis Blanding.

Boracic Acid in the Sea-water on the Coast of California.

The following interesting paper on boracic acid in the sea-water of the Pacific, on the coast of California, was read by Dr. John A. Veatch before the California Academy of Natural Sciences. The facts presented may lead to important results in various ways, and deserve attention from scientific men. The Doctor said:

The existence of boracic acid in the sea-water of our coast was

brought to my notice in July, 1857. I had, in the month of January of the previous year, discovered borate of soda and other borates in solution in the water of a mineral spring in Tehama county, near the upper end of the Sacramento valley. Prosecuting the research, I found traces of boracic acid—in the form of borates—in nearly all the mineral springs with which the State of California abounds. This was especially the case in the Coast mountains. Borate of soda was so abundant in one particular locality, that enormous crystals of that salt were formed at the bottom of a shallow lake, or rather marsh, one or two hundred acres in extent. The crystals were hexehedral with beveled or replaced edges, and truncated angles; attaining the size, in some cases, of four inches in length by two in diameter, forming splendid and attractive specimens. In the same neighborhood, a cluster of small thermal springs were observed holding free boracic acid in solution. A few hundred yards from these a great number of hot springs, of a temperature of 212° Fah., rose up through the fissures of a silicious rock. These springs held a considerable quantity of borax, as well as free boracic acid. Many other localities furnished similar indications, but in a less extensive form.

In progress of the examination I found that the common salt (chloride of sodium) exposed for sale in the San Francisco market, and which, it was understood, came from certain deposits of that article on the sea-margin in the southern part of the State, also furnished boracic acid. I was led to attribute it to the fact of mineral springs emptying into the lagoons furnishing the salt. It was, therefore, a matter of no small surprise, when on a visit to the localities, I found no trace of acid in any of the springs in the adjacent district. This led to an examination of the sea-water, and a detection of an appreciable quantity of boracic acid therein. It was at Santa Barbara where I first detected it, and subsequently at various points, from San Diego to the Straits of Fuca. It seems to be in the form of borate of soda, and perhaps of lime. The quantity diminishes towards the North. It is barely perceptible in specimens of water brought from beyond Oregon, and seems to reach its maximum near San Diego.

This peculiarity seems to extend no great distance seaward. Water taken thirty or forty miles west from San Francisco gave no trace of acid. In twelve specimens, taken at various points betwixt this port and the Sandwich Islands, furnished me by Mr. Gulich, of Honolulu, only that nearest our coast gave boracic acid. In ten specimens kindly furnished me by Dr. W. O. Ayres, taken up by Dr. J. D. B. Stillman, in a trip of one of the Pacific mail steamers from Panama to this place, no acid was observed south of the Cortez Shoals.

I have not as yet been able to obtain specimens of water south of San Diego, nearer the shore than the usual route of the mail steamers. Neither have I been able to test the breadth of this boracic acid belt any further than the fact above stated, of no acid being found at the distance of thirty or forty miles west from the Golden Gate. I think it probable that it is confined within the submarine ridge running parallel with the coast, the southern portion of which is indicated by

certain shoals and island groups. The source of the acid is undoubtedly volcanic, and the seat of the volcanic action is most likely to exist in this submerged mountain range. It strengthens the probability of the eruptive character of the Cortez Shoals.

I hope in future to be able to make more accurate and extended examinations, unless some one more capable of doing justice to the subject should take it in hand. With this view, I solicited the attention of Dr. J. S. Newberry to these facts, while he was in this city, on his way to join Lieut. Ives' Colorado Exploring Expedition, hoping he might think it worthy of investigation during his stay on this coast. With the same view, I now submit them to the Academy.

Proceedings of the British Association for the advancement of Science. 29th Annual Meeting, 1859.*

SECTION G.—*Mechanical Science.*

Friday.—"Report of the Patent Committee."—This Committee, which was appointed at Leeds, last year, states that it appears by the Annual Report of the Commissioners of Patents just issued, that above 3000 applications are made annually for patents; that of these 1000 are dropped at the first stage, leaving only 2000 to be completed as patents; that the £50 payment at the end of the third year, in order to keep the privilege on foot for seven years more, causes 1500 of the 2000 patents to drop at the end of the third year, leaving 500 only remaining, and that of this 500, the Commissioners of Patents estimate that in consequence of the required payment of £100 at the end of the seventh year, 100 only will survive to complete the term of fourteen years. The Committee's Report points out that the large estimated surplus, amounting to £100,000 annually, was properly suggested by the Commissioners as applicable to the building and maintaining suitable offices for the Commission, including a free library and a museum of inventions. The Committee recommends that, after carrying out these objects, the fees received from patentees should be reduced to an amount not more than sufficient to defray the expenses of the office; but that if such a course was not adopted, then that the sums received from inventors should be carried to an "Inventors' Fee Fund," to be applied for the benefit and promotion of science and industry.

"On Experiments to determine the Efficacy of continuous and self-acting Brakes for Railway Trains," by Mr. W. FAIRBAIRN.†

"Description of Glasgow Waterworks," by Mr. J. F. BATEMAN.

"On a Safety-Cap for Mines," by Mr. R. AYTOUN.

"On the Rivers 'Dee,' forming the Ports of Aberdeen and Chester," by Mr. J. ABERNETHY.

The ASTRONOMER ROYAL, having been officially engaged in investigating the estuary of the Dee at Chester, said, that he thought that engineers were too often apt to forget that if that had a scour out that there was also a scour in, and that the weight of stone carried by a current varied as the sixth power of the velocity, and that the movement of the flow was more rapid than that of the ebb. He believed

* From the Lond. Athenæum, Oct. 1859.

† See Jour. of the Franklin Institute, p. 12.

that, do what they could, the estuary of the Dee at Chester was doomed. Liverpool estuary was also filling up. He objected to the groynes which had been made.—Mr. G. RENNIE remarked, that one-third of the area of the estuary had been destroyed, by embankments formed by proprietors of property on the sides.—Mr. J. F. BATEMAN said, that groyning in the Clyde had been beneficial, and the navigation of the Clyde had been improved to an extent which had no parallel.—Capt. Sir E. BELCHER had had much experience in these matters, and he found that the flood-tide of salt water coming in lifted the fresh, and ripped up the bed of the river. He did not approve of straitening their courses.—Mr. WEBSTER thought that straitening and deepening were most beneficial. It caused an anticipation of the time of high water, and there was a longer ebb aiding in this scour.—The ASTRONOMER ROYAL approved of the restricting the water to a narrow channel, and he thought that the efficiency of the out-scouring was greatly due to the amount of fresh water coming down.

Saturday.—"On the Result of Boring for Water in the New Red Sandstone, near Shiffnal, in the County of Salop," by Mr. J. F. BATEMAN.—The supply of water to Wolverhampton being found insufficient, new works have been constructed by the author for bringing the water from the River Worth, nine miles from Wolverhampton and three from Shiffnal. The River Worth, at the place where the pumping-works are erected, is not more than forty or fifty feet above the Severn, which it joins at Bridgwater, eight or ten miles distant. It may therefore be considered as the bottom of a basin little above the level of the sea. From the character of the surrounding hills, and the inclination of the beds of New Red Sandstone, it appeared to the author of the paper likely that although the wells previously sunk on the high plateau of Wolverhampton had proved comparative failures, a considerable quantity of water might be found in the sandstone at the lower level, and that some might overflow, as an artesian well. A bore-well was accordingly commenced near Shiffnal, 12 inches in diameter, and continued for 70 feet, when it was diminished to 7 inches, and carried down to a total depth of 260 feet from the surface. Water was met with first at a depth of 22 feet, and from that time it rose with increasing supply to the surface, and flowed over as an artesian well, giving a supply in the end of 210,000 gallons daily. Throughout the whole depth of boring the work varied but little in character. It was nearly all hard rock, sometimes very hard, with occasional beds of soft stone. For the last 40 feet or so the soft beds were thicker; but otherwise there was little change from top to bottom. As the whole well is charged with water to the level of the river, which forms its natural outlet, and as the boring shows that the lower beds receive their supplies from distant sources, the supply may reasonably be expected to be inexhaustible within the limits of that which is due to the percolation of the rain upon the collecting area.

"On a Patent Chain Propeller," by Mr. W. ROBERTSON.*

"On the Manœuvring of Screw Vessels," by Admiral PARIS.—The author showed how vessels furnished with the screw-propeller could,

* This article will be published in our next number.

whether making way or not, be guided and manœuvred; and expressed his opinion that the Great Eastern, furnished, as she was, with paddles and screw, would be the most handy vessel ever yet built. The paper contained a vast amount of technical details, which could only be understood by nautical men.

Sir E. BELCHER bore testimony to the importance and value of the paper.

"On the True Action of what are called Heat Diffusers," by Mr. A. TAYLOR.

"On a Boat-Lowering Apparatus," by Mr. A. BATTEN.

"On a Mode of Suspending, Disconnecting, and Hoisting Boats attached to Sailing Ships and Steamers at Sea," by Mr. E. A. WOOD.

"On Smokeless Coal-burning Locomotive Engines," by Mr. D. K. CLARK.—This arrangement cannot be fully described without reference to diagrams; but it may be stated that a perfect combustion is obtained by means of several steam jets, which cause a strong blast of air to be brought in contact with the burning fuel.

In the discussion, it was stated that the arrangement was in successful use, and with economy in consumption of fuel.

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*Experiments on Cast Iron.**

A series of valuable experiments has recently been carried on under the superintendence of Col. F. Eardley-Wilmot, superintendent of the Royal Gun Factories at Woolwich, upon various British irons, with a view to determine the most suitable varieties for the manufacture of cast iron ordnance. The results of these experiments are printed in a tabular form in a parliamentary report lately issued. The tables occupy nearly the whole of a thick folio book, and show the strength of various specimens of iron supplied by the principal iron founders of the kingdom, when subjected to tensile, transverse, torsion, and crushing tests.

"The general results of a considerable number of such experiments are shown in the following table:—

	Specific gravity of 850 specimens.	Tensile of 850 specimens.	Transverse of 564 specimens.	Torsion of 276 specimens.	Crushing of 273 specimens.
Maximum, .	7 340	34,279	11,321	9,773	140,056
Minimum, . .	6 822	9,417	2,586	3,705	44,563
	Of fifty-one samples.	Of fifty-one samples.	Of 53 samples.	Of fifty one samples.	Of fifty-one samples.
General Mean.	7·140	23,257	7,102	6,056	91.061

From the prefatory remarks to the tables we quote the following passages, which indicate some remarkable peculiarities in the condi-

* From the Lond. Civ. Eng. and Arch. Journal, Dec., 1859.

tion of the specimens of iron, and the effect which a slight change of circumstances in casting produced on the strength of the metal.

"The results already obtained by various experiments on the subject of re-melting cast-iron are well known, and have been repeated at various times in this department; when, however, the experiment is made with large masses of iron of several tons, the effect produced is not so marked. It would appear that without any considerable diminution of the impurities in the metal, as silicon, sulphur, and phosphorus, a considerable increase of tenacity and specific gravity can be obtained. The graphite is partially expelled, and some of it is converted into combined carbon, and the contraction and crystallization is more energetic and complete. This combined carbon can, it is thought by some, on again re-melting the mass, and very slowly cooling it, be reconverted to graphite, rendering the iron soft and fusible. This is undoubtedly the case with the product of the refinery process known as 'metal,' the use of which on this principle formed the subject of a patent by Dr. Price in 1856.

There is a point not probably accurately determined at which the maximum hardness corresponding to the maximum tenacity may be found. In an iron cannon there is, however, required an elasticity in addition to other qualities, when these qualities are not in excess to such an extraordinary degree as to render the mass so strong and rigid as to obviate any danger of disruption. It has been found in the various experiments made at Woolwich, that in most cases where the specific gravity is 7·3 or upwards, the metal is unsuited for gun purposes, on account of its hardness and want of elasticity; while the same iron treated in the furnace for a shorter time, and being when cast of a lower specific gravity and less tenacity, would have resisted more satisfactorily the explosion of the powder.

The most decided features to be observed in the results are the universal and very marked superiority of the bars in the cases where they have been cast horizontally over those cast vertically; and the superiority, but in a less marked degree, of the bars cooled quickly over those cooled gradually or slowly. It is to this rapid cooling and condensation that the superior strength of a 2-inch bar cast from a portion of the metal of which a gun is made is due.

This is almost universally found to be the case in the experiments hitherto made with a portion of metal taken from the dead-head, close to the muzzle of the gun, as compared with the bar cast at the time of making the gun.

The contrast as regards appearance is equally marked. In the bar a close grey rigid appearance; in the dead-head a large grain with graphitic masses joined or cemented together with a whiter and harder material.

The demand for the manufacture of iron ordnance, and the necessity for the supply of a certain number to meet what is expected in this country of a new government establishment, has prevented such various experiments being made as are desirable. At a new government foundry on the continent, established about the same time, two

years were allowed for experiments before a 'supply' was demanded. It would appear that a great deal is still to be done on this subject, and that we are only now at the commencement of vast improvements in the manufacture of cast iron and cast steel."

Extraordinary Steam Hammer.

From Herapath's Railway Journal, No. 1063.

An enormous steam hammer, on Naylor's patent principle, for the Victorian Railway Company of Australia, has just been made by the Kirkstall Forge Company, Leeds, for manufacturing large forgings. The hammer is upon the double and single action principle, that is, it is not only lifted by the pressure of steam from below, but the natural effect of gravity of the falling hammer is assisted by the pressure of steam from above. By this means additional momentum is acquired, and a blow of most extraordinary force and rapidity is produced, which is particularly advantageous in the manipulation of iron forgings of magnitude requiring a great number of blows. The work is thus finished at one heat, saving both the fuel and time of second heats, also consequent deterioration and waste of iron. The effect of the blow of this immense hammer will be equal to the momentum acquired by sixteen tons making forty blows per minute. The hammer can be made to work double or single acting, instantaneously; and by the adjusting valve gearing, the length of stroke and force of blow can be changed also instantly. In all gravity hammers the effect of the blow is dependent on the weight of the hammer, multiplied by the height of its fall, and consequently, the greater the distance it falls the greater the force of the blow, and the slower is the speed of working. In the double-action hammer thrice the force of blow can be given at double the speed. The principal dimensions and weights are—timber foundation, 26 ft. by 24 ft. 6 in., depth 13 ft.; cast iron anvil block, base 11 ft. 6 in. by 9 ft. 6 in., 30 tons weight; base plate to receive standards, 19 ft. 6 in. by 15 ft. 6 in., 14 tons weight; standards 10 ft. 6 in. apart, weight 15 tons; height from ground to top of steam cylinder, 21 ft. 6 in.; weight of all about 75 tons. Steam to work this hammer is generated from the furnace in which the work to be operated upon is heated, the boiler, upon "Balmforth's patent vertical principle," forming the chimney, and the heat passing up four flues in the same, thus economizing fuel and avoiding the expense of a brick chimney. The boiler is 6 ft. 6 in. diameter, and 30 feet long,—weight 15 tons. The weight of the whole apparatus, including boiler and mountings, is about 100 tons.—*Leeds Mercury*, Oct. 15th.

Electric Light.

In the last number of the *Cosmos* which we have received, (4th November,) the Abbé Moigno speaks of a series of experiments in progress at Chaillot, in regard to the application of the electrical light

to light-houses, and affirms that the results have been so unexpectedly favorable as to leave no doubt of the definite adoption of the new system. The electricity is generated apparently by a magneto-electrical machine moved by a steam engine of two horse power. But the most remarkable improvement is that described as follows: "Experiment has proved that by a slight modification in the electric lamp, the alternating currents may be used without any reversal. We ourselves established that two hundred interruptions per second in the direction of the current did not prevent the light from being perfectly continuous, and did no injury to the play of the regulator." And he very truly adds, "This is an immense progress, which leads to the complete solution of the problem of the electric light. The moment that we are not compelled to reverse the currents, the currents of induction may be received and transmitted without solution of continuity; there is no longer any spark, or noise, or burning, or destruction of contact; and the production of the electric light equal to several hundred Argand burners is now but child's play—and requires but little expense." What this slight modification in the lamp is, the Abbé does not mention, but we suggest the subject to our American inventors, remarking that by far the best electrical light, both as to constancy, brilliancy, and ease of management, is the arrangement invented by Eben C. Jayne, of this city. We know that he has contemplated its application to light-houses, and we hope that our Light-House Board will give him and others every facility for experimenting on so important a subject.

The Abbé Moigno also asserts, what we have not seen mentioned elsewhere, that the South Light-house at Dover, has been lighted by electrical-light in place of oil lamps, and that the results under the management of Mr. Holmes are "eminently favorable." The subject is a very important one. ED.

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*Compressed Fodder.**

An ingenious invention has just been adopted by the French Minister of War for the better feeding of cavalry horses when on the march. M. Naudin, veterinary surgeon of the Imperial Guard, has succeeded in compressing the food for the journey into small tablets like those already in use composed of vegetable food for the army. M. Naudin has given publicity to his process, and it is destined, no doubt, to render immense service to the commissariat departments in every country. The hay and straw are chopped fine, the oats and corn crushed, and then mixed in proportion to the nutritive qualities afforded by each. Upon the mixture is poured a mucilaginous residue of linseed, and the whole is pressed and comes out in a hard cake, only requiring to be dried in the oven. Although invented for the emergencies of war, this method of preserving fodder may be found most valuable in reducing the space occupied by the food of cattle on board ship, in distant encampments, or in the long marches of emigration parties. At any rate the method is a valuable extension of Chollet's invention, and has been eagerly adopted for the provender of the French cavalry of the army of Italy.

* Journal of the Society of Arts, No. 347.

Performance of the U. S. Steamer Wyoming.

To the Editor of the Journal of the Franklin Institute.

In the accounts in the *Jour. of the Franklin Institute*, October and November last, of the performances of the *Wyoming*, there are certain items which appear anomalous, and of which some scientific explanation would gratify some of your readers. Amongst them are the following:—

1. It appears that on increasing the H. P. developed from 302 to 1088, the coal per H. P. diminished from 3·60 to 2·40 lbs, thus reversing the generally received rule that the greater the boiler surface for a given quantity of work, the greater the efficiency of each lb of coal. This rule receives remarkable confirmation from the experiments in the *San Jacinto*, where two boilers as nearly as possible alike in all other respects, showed an evaporation per H. P. of anthracite of 6·827 *vs.* 7·892, the total heating surface being 2·663 *vs.* 3·073, efficiency 100 *a* $115\frac{6}{10}$, surface 100 *a* $115\frac{4}{10}$.

2. A similar effect seems to be produced by the condenser, the vacuum increasing with the quantity of steam condensed being 22·45 inches with 302 H. P., 22·50 with 535 H. P., and 23·34 with 791 H. P., thus differing from the rule that the power of a condenser is in some *direct* proportion to its surface.

3. The great difference between the vacuum gauge, and the vacuum shown in the cylinder by the diagram. The former being reported at 23·50, whilst the diagram (November No.) shows only from 5 *a* 10 lbs. =10 *a* 20, or a mean of 15, inches, making a difference of 8·50, or nearly 20 per cent. of the whole mean pressure or power of the engine.

4. In the diagram for November, steam cut-off at about half stroke at 22+15=37 lbs, shows at end of stroke, when its volume has been only doubled, 12 lbs.; but not so much by 50 per cent. as is generally supposed due to this expansion.

This last fact, too, is in very strong contrast with an account given by that very careful experimenter who has issued Engineering Precedents, who, on the 14th page of this work, No. 2, gives an account where 20+15=35 lbs, pressure of steam when cut-off at 22 per cent. has a final pressure of 14·8 lbs, or, with four and a half expansions, less reduction than the *Wyoming* has with two.

As it is one of your objects to reconcile art with science, I hope you will not consider the inquiries impertinent from an AMATEUR.

In reply to the above communication the attention of "Amateur" is called to the following facts:—

1st. That when only 302·3 H. P. were indicated, the machinery was comparatively new, and the friction incident to new machinery prevented the attainment of such velocity of piston as was afterwards obtained with the same pressure; while the losses from wastage of coal in the furnaces, ashes, and other impurities, radiation from surfaces of boilers, steam-pipes, cylinders, &c., priming and leakage were the same as if the engines had been moving at double the speed. Besides which, there was at that time less expansion, more wire drawing, and a lower pres-

sure of steam, all of which tend to increase the consumption per Horse Power. If *Amateur* will compare the average results of the outward and homeward passages to and from Charleston, he will note the following:—

Outward.—16·2 pounds of steam, cut-off at 10·62 inches, throttle $\frac{6}{10}$ open, and 23·29 ins. of vacuum, produced 58·2 revolutions per min.

Homeward.—16·9 pounds of steam, cut-off at 10·78 inches, throttle $\frac{7}{8}$ open, and 21·68 inches of vacuum, produced 71·45 revolutions per minute.

The average of weather during these two trips was very nearly the same: slightly in favor of the homeward trip, but not nearly enough to produce so marked an increase of speed, which was principally owing to the reduction of friction of the engines, *per se*, enabling them to attain an increased velocity and thereby to develop more power, the constant losses alluded to, remaining the same. Hence, also, it will be seen that in the homeward trip, developing 637·8 H.P., the consumption was 2·73 lbs. per H. P., against 3·17 lbs. per H. P. for 433·9 H. P. on the outward trip.

It is, of course, true that more coal per hour was consumed, but that has no bearing upon the position taken, which is that with the *same pressure* upon the piston, a less velocity was obtained, while the constant losses were unaltered; consequently a smaller per centage of the fuel was utilized, and the comparative cost of each H. P. enhanced.

As regards the consumption per H. P. during the last experiment recorded, a different (and much better) quality of coal was employed, and therefore no accurate comparison could be entered into. The rule mentioned by *Amateur* holds good only when the speed of the engines, and their friction, remain nearly the same; as was the case in the *San Jacinto*, to which he refers.

As an illustration of the above, suppose the friction of the engine, *per se*, amounts to 1·5 lbs. per sq. inch of the piston, and the mean effective pressure to 12 lbs. during the whole stroke; 10·5 lbs. will be applicable to propulsion tending to produce motion. If, instead of 1·5 lbs., it required 3 lbs. to overcome the friction, only 9 lbs. remains to produce motion. It is then obvious that less speed of piston would be the result, and consequently less power would be developed in a given time.

It should not be forgotten that (especially in marine engines) a large per centage of the coal consumed in the boiler furnaces, expends its useful effect before the steam acts upon the pistons, no matter how carefully constructed, or how well planned the machinery may be, while the power indicated on the engines is the only test we can apply to the power utilized.

2d. With regard to the vacuum produced in the condenser. There is no such rule as that supposed by *Amateur*, that the vacuum "bears some direct proportion to the surface," unless the surface is taxed to its full power. In the case of the *Wyoming*, the surface is so much in excess of what is required, that the temperature was reduced to 80° or 90° even when working off the steam from 1000 H. P. The deficiencies in vacuum were due, not to imperfect condensation, but to air leaks

at the stuffing boxes of the piston rods and air-pumps: and it was found, when these were the same, that the higher the speed of piston the higher was the vacuum attained, owing, no doubt, to the increased capacity of air-pumps thereby developed.

An examination of the logs recorded, shows that the vacuum attained bore no fixed proportion to the speed or power. On the last log, after the fresh water air-pumps had been freshly packed, 25 inches were attained at 67 revolutions; and it is probable that with continued working, this vacuum will be still further improved. A close surface condenser differs from others in this, that its capacity of air-pumps being less, and there being no other outlet for the air contained in the steam, air-tight packings are essential; and these cannot be obtained with horizontal pumps, at least, (if ever) until the machinery has worked for some time.

3d. The difference between the vacuum gauge and the back pressure in cylinders must always exist to a certain extent, and particularly in quick working engines, when it is not possible to obtain ports large enough to void the cylinders with sufficient rapidity. The length of exhaust-pipes causing friction in them and the passages, and the surplus pressure required to put the steam in motion at such high velocity, all increase this evil. In side-wheel engines moving at slow speed, this difference generally amounts to from 1 to 1½ lbs.

Now, in the first card shown, while the vacuum gauge showed 21½ inches, or . . . 10·75 lbs. (nearly),
the average vacuum was . 9·9 lbs.
Difference, ·8 lbs.

In the last cards, the gauge showed 23·5 inches, or 11·7 lbs, while the average back pressure was for one set, (full lines,) 9·2,
and for the other, . . . 10.
giving a mean of . . . 9·6 lbs.
Difference, 2·1 lbs.

In one of the latter, the vacuum line is, for some cause not explained, about two-thirds of the stroke in coming down to the proper vacuum.

It therefore appears, that notwithstanding the high speed, the "loss of power" from this cause, was rather less than usual, when the engines were working at 72 revolutions, and producing 640 H. P., and that it was not extraordinarily great when developing 1080 H. P., at 80½ revolutions.

4th. In the diagram for November, although the *average* pressure of steam entering the cylinder was over 22 lbs., yet *Amateur* should not overlook the fact that in consequence of wire drawing the steam *when cut-off* at 13·7 inches from commencement of stroke, was reduced to about 19 lbs. on one, and 18 on the other, mean, 18·5; which, if Mariotte's law were strictly correct, if there were no leakage, and no condensation, would reduce its pressure to 17·16 lbs. when the exhaust valve was opened, which was after the piston performed 28·5 inches of its stroke.

$$\text{Because, } \frac{13{\cdot}7+1{\cdot}9}{28{\cdot}5+1{\cdot}9}\times(18{\cdot}5+14{\cdot}7)=17{\cdot}16.$$

While in reality, by the cards it was—for one set (full lines) 14·2 and by the other 14·6 lbs. average 14·4 lbs. or 2·76 below the theoretical pressure. This difference was undoubtedly caused by condensation, and shows that the leakages could not have been large: for wherever the end pressures are equal to or greater than they ought to be, leakage is established as a condition of the case.

And in this connexion, it may be remarked, that the higher the end pressure should be, theoretically (there being no leakage), the more will the real end pressure be reduced: for with very low end pressures, a second evaporation takes place in the cylinders, due to the heat absorbed by them, reducing thereby the condensation, and of course, assimilating the pressures, real and theoretical.

As regards the case adduced by "Amateur," when $4\frac{1}{2}$ expansions of 34·7 lbs. total initial pressure, gave 14·8 lbs. final, we can only say again that, as $\frac{34{\cdot}7}{4{\cdot}5}=7{\cdot}71$ lbs.

theoretical end pressure, the difference between that and 14·8 must have been made up in some way—and we should be disposed to attribute it, principally, to leakage of the valves. J. V. M.

For the Journal of the Franklin Institute.

Aerometry. Translated from the Hydraulics of D'Aubuisson de Voisins. By J. Bennett.

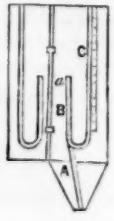
490. Aerometry, or the science of the motion of aeriform fluids, which may properly be termed aerodynamics, may be investigated under the three following conditions:—1st. When the fluids issue from the effect of compression, from a reservoir in which they are inclosed. 2d. When they move in conduit pipes. 3d. When they act as motors.

Before entering upon these subjects, let us refer to some of the properties of air, and more especially of atmospheric air.

Mechanical Properties of Air.

491. Atmospheric air, though composed of azote and oxygen, two essentially different gases, and simply mixed, is regarded in mechanics as a homogeneous body.

492. *Elasticity.*—Like all aeriform fluids, it is eminently elastic. By reason of elasticity, it constantly tends to occupy a greater space; so that when inclosed in a vase, it exerts in virtue of this tendency, an effort or pressure against the sides of the vessel. According to the principles of hydraulics, and disregarding the weight of the fluid, the pressure is equal upon all points of the sides: so that if a manometer*



* The manometer used in the experiments to be reported hereafter, consists of a glass tube bent round parallel to itself, inserted in a piece of wood with a hinged cover. The first of the three branches A B C of the tube passes behind the second: it is empty, and the two others contain in their lower half mercury or colored water. The instrument is inserted by the conical end into a circular hole made in the air reservoir. When the fluid is compressed, as it communicates through the branch A, with the top of the branch B, it presses the liquid downwards, and forces it up the branch C; then the difference of level of the liquid in the two branches is the manometric height, or measure of the elastic force.

is placed upon one of them, the height to which the mercury or other fluid may be raised, will indicate the *pressure*, or *tension*, or *elastic force* of the enclosed air.

493. *Compressibility.*—The air is compressed under the weight with which it is loaded, and in proportion to the weight. This law, established by Mariotte, and verified long since for small loads, has been confirmed by the beautiful experiments of MM. Dulong and Arago,* up to the enormous load or pressure of 67·236 feet of height, a pressure of twenty-seven *atmospheres*, or equal to twenty-seven times that due to the weight of our atmosphere, and is indicated by the height of the barometer at the level of the sea, a height generally estimated at 2·49 feet = 29·88 ins. (The most exact observations give as a mean at this level, from my computations 2·5 ft. = 30 ins., the mercury being reduced to 32° Fah. of thermometric temperature.)

494. *Dilatation by heat.*—Air is dilated by heat: and $\frac{1}{480}$ or 0·00208 its volume for each degree of Fahrenheit, starting from 32° of this thermometer; so that the volume of a mass of air, represented by 1 at 32°, will be represented by $1+0{\cdot}00208\,(t'-32°)$ at t' degrees. All aeriform fluids follow this law of dilatation, as well as that of compression proportional to the weight.

495. *Weight of Atmospheric Air.*—The density of bodies, their masses being the same, are in the inverse ratio of their volume; so that the densities of the same fluid mass at 32° and at t °, will be to each other as $1+0{\cdot}00208\,(t°-32°)$ is to 1. Weights, under the same volume, follow the ratio of the densities; and so it will be with the *specific gravity* of bodies, which is their weight at a given unit of volume.

The specific weight of an aeriform fluid will then be a function of the load which compresses, and the heat which penetrates it; it will increase with the load, and diminish with the heat, in the ratio to be indicated.

From the experiments of MM. Biot and Arago, a cubic foot of dry atmospheric air at 2·493 feet of load, or barometer pressure, and at 32° of temperature, weighs 0·08112 lbs. Thus under a barometric pressure represented by b, and at a temperature t, the weight of a cubic foot, or the specific weight of dry atmospheric air will be

$$0{\cdot}081121\,\frac{b}{2{\cdot}493}\cdot\frac{1}{1+0{\cdot}00208(t-32°)}=\cdot032533\,\frac{b}{1+0{\cdot}00208\,(t-32°)}$$

The aqueous vapor always existing in atmospheric air, in a greater or less quantity, being lighter than air, diminishes its weight in mixing with it; and as, other things being equal, its quantity is greater as the weather is warmer, we must regard its effect by increasing a little the multiplier of t, or raising it to ·00222. We may accordingly establish the weight of a cubic foot of atmospheric air at

$$\cdot032533\,\frac{b}{1+\cdot00222\,(t-32°)}.$$

If 1 represent the weight of a volume of dry air, remembering that the vapor of water

* Annales de Chimie et de Physique. Tome xliii, 1830.

is lighter in the ratio of 5 to 8, we find that the weight of the same volume, containing also a certain quantity of this vapor, is $1 - \frac{3\,n\,f}{8\,b}$: an expression in which b indicates the height of the barometer in this air, and $n\,f$ the elastic force of the vapor at the temperature t, in a space saturated with it; and we have

$$0{\cdot}28\,t - 0{\cdot}000063\,t^2$$

$$^{*}f = 0^{m}{\cdot}00512 \times 10.$$

HYGROM.	n
100°	1·00
95	0·89
90	0·79
85	0·70
80	0·61
75	0·54
70	0·47
65	0·40
60	0·35
50	0·28

The number n is the ratio between the quantity of vapor contained in a space, where the hygrometer is kept at a certain degree, and the quantity contained in the same space, when it is entirely saturated, and when, consequently, the hygrometer is at 100°, the temperature being the same. M. Gay-Lussac has provided a table of the values of n, corresponding to the different degrees of the hair-hygrometer: the adjoining table is taken from it. I have elsewhere shown (1) that the substitution of the approximate factor

$$\frac{1}{1 + {\cdot}00222\,(t - 32°)}$$

For the theoretic factor,

$$\frac{1 - \frac{3\,n\,f}{8\,b}}{1 + {\cdot}00208\,(t - 32°)}$$

will not occasion an error of more than a thousandth in the weight of the air taken in the usual condition of the atmosphere.

496. *Weight of Air compared with that of Water.*—A cubic foot of water weighing 62·448 lbs., and the cubic foot of air ·032533 lbs. $\frac{b}{1 + {\cdot}00222\,(t - 32°)}$; the ratio between these weights, which is $1919{\cdot}5\,\frac{1 + {\cdot}00222\,(t - 32°)}{b}$, expresses how many times the weight of the water exceeds that of the air; it will be 800 times, at 50° Fah., and at 2·493 feet of barometer.

497. *With Mercury.*—The cubic foot of mercury at 32° weighs

$$\frac{849{\cdot}242}{1 + {\cdot}0001\,(t - 32°)}.$$

Thus the ratio between the weight of this substance and that of air, will be

$$\frac{849{\cdot}242}{{\cdot}032533}\,\frac{(1 + 0022\,(t - 32°))}{b\,(1 + {\cdot}0001\,(t - 32°))} = 26103{\cdot}8\,\frac{1 + {\cdot}00222\,(t - 32°)}{b}$$

observing that the factor ·0001 $(t - 32°)$ is always very small: and in neglecting it we correct somewhat the effect of vapor upon the weight of the air.

I remark that 26099 feet is the height of the atmosphere, on the supposition of a constant density, the air being throughout at 2·493 lbs. pressure and 32° of temperature.

498. *Weight of any Gas.*—Usually atmospheric air is taken as a term of comparison with other aeriform fluids or gases; if p be the ratio of density of any gas to that of air, or the *specific weight* of the gas, the weight of a cubic foot will be

$$·032533\,p\,\frac{b}{1 + {\cdot}00222\,(t - 32°)}.$$

* In metrical units; t being in centigrade divisions.

SECTION FIRST.

The motion of air issuing from a reservoir in which it is compressed.

499. *Force by virtue of which the fluid issues.*—Let us take for the reservoir a tight box, containing air in its natural state, or at the simple pressure of the atmosphere, a pressure which we always distinguish by b: if we make an opening at one of the sides, the molecules of air in its vicinity, being pressed on all sides alike, by the same force (effort) b, will remain in equilibrium; they will not issue and there will be no motion.

But if the interior air receives a pressure: for example, if the cover of the box be movable as a piston in the body of a pump, and charged with a weight, the air will be more pressed than that outside; and its molecules, yielding to the excess of pressure, will issue. Suppose a manometer fitted to the box is raised the height H, this height will measure the resultant pressure of the weight upon the cover; the molecules in front of the opening will be urged outwards by the force $b+\text{H}$; they will be repelled by b: these two forces, acting in opposite directions, will have for a resultant their difference, which is H. The issue will take place as if this force alone acted upon the air of the reservoir, and it issued in a void.

500. *Velocity of issue.*—It is known that when a fluid issues from a vessel, by virtue of a pressure exerted upon it, its velocity is due to a height equal to that of a column of issuing fluid, whose weight is a measure of the pressure. This height is evidently H increased in the ratio of the density of the manometric fluid, to that of the issuing fluid. D being the first of these densities, and d the second, calling V the velocity of issue, we shall have

$$\text{V}=\sqrt{2g.\,\text{H}\,\frac{\text{D}}{d}}.$$

If the manometric fluid is mercury, the air issuing under the pressure $b+\text{H}$, and having the temperature 32°, we have

$$\frac{\text{D}}{d}=26103{\cdot}8\frac{1+00222\,(t-32°)}{b+\text{H}}(497):$$

Consequently, reducing and making $1+{\cdot}00222\,(t-32°)=\text{T}$.

$$\text{V}=1296\sqrt{\text{H}\,\frac{\text{T}}{b+\text{H}}}.$$

In case of H being neglected by reason of its small ratio to b, this last quantity being usually estimated at 2·493 feet, and admitting a temperature of 53·6°, we shall have

$$\text{V}=840{\cdot}4\,\sqrt{\text{H}}.$$

501. *Discharge.*—If S represent the area of section of orifice, the volume of air flowing in a second of time will be

$$1296\ \text{S}\sqrt{\text{H}\frac{\text{T}}{b+\text{H}}}.$$

This is the theoretic discharge.

But here also, the contractions experienced by the vein of air, in its passage through an orifice, reduce the discharge.

Let m be the co-efficient of reduction, and Q the actual discharge, we shall have

$$Q = 1296\, m\, s \sqrt{H \frac{T}{b + H}}.$$

502. *Experiments to determine Co-efficients.*—We must now determine m for different kinds of orifices. I have devoted myself to this determination, and have made numerous experiments upon the subject, the details of which were published in the *Annales des Mines*, (Tome xiii, 1826.) I proceed to give a table of results, after giving a description of the apparatus used.

The principal part was a gasometer or cylindrical box, open underneath, with a diameter of 2·13 feet and 2·62 feet high. On its upper end, carrying a manometer with colored water, I made at random orifices or ajutages differing in form and size. This gasometer was placed upon a cask full of water in which it descended, being enclosed between four vertical iron rods; it was charged successively with 17·64, 35·28, 52·92, 70·56, and 83·2 lbs., and sometimes with 4·41, 8·82, 13·23, and 26·46 lbs. so as to vary the velocities of the issuing air.

From the indications of the manometer, and the area of the orifices, was derived the theoretic discharge. By multiplying the section of the gasometer by the height of its fall per second, a height derived from the number of seconds required for its descent from a given elevation with a uniform motion, we have the real discharge. This divided by the first, gives the co-efficient sought.

503. *Orifices in a thin side.*—The air at first issued through circular orifices pierced in tin-plate, and the following results were obtained:

Diameter of Orifice.	Manometric Height.	Length of Descent.	Time of Descent.	Co-efficient. By Experiment.	Co-efficient. Mean.
ft.	ft.	ft.	seconds.		
·032	·0938	1·96	187	·623	
·032	·1640	1·96	141	·629	
·032	·2394	1 96	117	·628	
·032	·3215	1·96	102	·623	·630
·032	·3936	1·80	82	·642	
·032	·4724	1·80	76	·634	
·049	·0918	1·96	82	·643	
·049	·1640	1·96	60	·660	
·049	·2362	1·96	51	·647	·652
·049	·3215	1·47	32	·664	
·049	·4002	1·80	36	·648	
·065	·0885	1·96	46	·665	
·065	·1246	1·96	39·5	·642	
·065	·1640	1·96	34·7	·636	·646
·065	·1968	1·96	31·5	·641	
·098	·0885	1·96	20	·656	
·098	·1049	1·96	18	·686	
·098	·1246	1·96	16·5	·683	·673
·098	·1443	1·96	15·5	·675	
·098	·1640	1·96	14·7	·664	
			General Mean,	. .	·649

A discussion of these different experiments causes us to adopt 0·65 as the co-efficient of reduction for orifices made in a thin plate.

For the running of water we had as a mean 0·62.

The diminution in the discharge of air, is then the effect of a real contraction of the fluid vein; this may be rendered apparent by charging the air with smoke, when the contraction of the vein becomes distinct at its issue from the orifice.

NOTE.—A Swedish savan, Lagerhjelm, has also made experiments upon the flow of air through orifices in a thin plate. Their diameter was ·039 feet, ·078 feet, and ·108 feet; the manometric pressures were from ·190 feet, up to 1·571 feet; the co-efficients obtained varied from 0·58 to 0·70, and their mean term was at 0·62. Most frequently the flow, having but a few seconds duration, and the results not presenting the same uniformity as ours, we cannot equally confide in them.

504. *Cylindrical ajutages.*—The cylindrical ajutages, or small additional tubes which I used, had the same diameters as the circular orifices. They afforded the experiments shown in the following table:

AJUTAGE.		Manometric Height.	Length of Descent.	Time of Descent.	CO-EFFICIENT.	
Diameter.	Length.				By Exper't.	Mean.
ft.	ft.	ft.	ft.	seconds.		
·0328	·1312	·0885	·1968	132	·910	
·0328	·1312	·1640	·1968	97	·912	
·0328	·1312	·2362	·1968	79·7	·925	·931
·0328	·1312	·3116	·1968	68	·947	
·0328	·1312	·3936	·1804	61	·920	
·0328	·1312	·4625	·1804	51·5	·940	
·0492	·1476	·0885	·1968	59	·923	
·0492	·1476	·1640	·1968	43·5	·922	
·0492	·1476	·2362	·1968	36	·930	·924
·0492	·1476	·3149	·1804	29	·927	
·0492	.1476	·3936	·1804	26	·916	
·0656	·1968	·0918	·1968	33	·896	
·0656	·1968	·1640	·1968	24·2	·915	·916
·0656	·1968	·2362	·1968	19	·934	
·0656	·1968	·3149	·1804	16	·919	
·0984	·2624	·0820	·1968	14	·964	
·0984	·2624	·1017	·1968	13·3	·934	·933
·0984	·2624	·1279	·1968	12	·902	
				Mean,	. .	·926

The accordance in these results is remarkable; it leaves no doubt as to the value of the co-efficient for cylindrical ajutages; it is from 0·92 to 0·93.

That of incompressible fluids, 0·82, was much less.

505. It was desirable to know to what point the length of the additional tube might affect the value of the co-efficient. In consequence, four tubes of ·049 ft. diameter, whose lengths are given in the following table, were chosen.

Length of Tube.	Co-efficient.	DISCHARGE.	
		Real.	Calculated.
ft.		cubic feet.	cubic feet.
0·049	·938	·02571	·02489
0·147	·924	·02472	·02468
0·531	·838	·02217	·02263
1·066	·738	·02013	·02051

Many series of experiments were made on each; in the third column is given the mean discharge obtained, and in the second, the co-efficient derived from it.

The rapidity of the decrease is very marked, and the theory to be unfolded in the next chapter, upon the effect of the resistance opposed by tubes to the motion of air, takes note of it, as appears from the last column of the table, which presents the discharge calculated in accordance with the theory.

506. *Conical ajutages.*—We pass to conical ajutages, those most generally used.

The better to compare their effects with those of cylindrical ajutages, the same orifice of issue and the same length were given to them.

AJUTAGE.			Height manometric.	Length of Descent.	Time of Descent.	CO-EFFICIENT.	
Diameter at		Length.				By Experim't.	Mean.
Outlet.	Inlet.						
ft.	ft.	ft.	ft.	ft.	seconds.		
·0328	·0656	·1312	·1640	1·968	96	·928	
·0328	·0656	·1312	·2362	1·968	81	·917	·927
·0328	·0656	·1312	·3149	1·968	69	·934	
·0328	·0656	·1312	·3930	1·968	62	·930	
·0492	·0984	·1476	·0918	1·968	57·5	·913	
·0492	·0984	·1476	·1640	1·968	43	·916	
·0492	·0984	·1476	·2362	1·968	36	·915	·917
·0492	·0984	·1476	·3149	1·804	28·5	·927	
·0492	·0984	·1476	·3930	1·804	25	·916	
·0656	·1312	·1968	·0885	1·968	32	·945	
·0656	·1312	·1968	·1213	1·968	27·5	·951	·936
·0656	·1312	·1968	·1640	1·968	24	·928	
·0656	·1312	·1968	·1968	1·968	22	·924	
·0984	·1968	·2624	·1312	1·968	12	·924	
·0984	·1968	·2624	·1640	1·968	11·5	·942	·933
					General Mean,	. .	·928

Thus, for conical ajutages as well as for cylindrical, the co-efficient is 0·93.

507. Wishing to know the effect of conical ajutages in the proportion of their convergence, or the increase of the angle formed by the opposite sides of the cone, I made five ajutages, all having at the outlet an orifice ·049 ft., but with different angles. They served me for a series of experiments similar to the others; I limit myself to giving the derived co-efficients.

AJUTAGE.		The manometric height being at					Co-efficient mean.
Angle of convergence.	Length. ft.	·092 ft.	·164 ft.	·236 ft.	·315 ft.	·039 ft.	
6° 26′	·1476	·939	·939	·940	·933		·938
18° 54′	·1476	·912	·916	·915	·927	·916	·917
53° 08′	·1476	·786	·810	·797	·803	·794	·798
11° 24′	·0820	·946	·939	·949	·960	·951	·947
28° 04′	·0328	·888	·877	·881	·881	·874	·880

A glance at the table shows the advantage of short and slightly converging ajutages. When the angle of convergence does not exceed from 10° to 12°, the co-efficient will be ·94 nearly: as it becomes greater, the co-efficient and discharge diminish, and we approximate to the phenomena presented by orifices in a thin side.

508. According with these facts, the value of m in the expression of discharge

$$1296\ m\ s\sqrt{H\ \frac{T}{b+H}},$$ will be

·65 for orifices in a thin side.
·93 for cylindrical ajutages.
·94 for slightly conical ajutages.

509. *Discharge through Nozzles.*—Nearly all the ajutages used in practice, such as the nozzles at the end of wind trunks in manufactories, of bellows, falling in with the last conditions, ·94 will often be the suitable co-efficient; still, on account of their length, and for greater surety, we shall adopt for these nozzles, ·93. Then, observing that $s = ·785\ d^2$, d being the diameter of the outlet orifice, we have

$$Q = 848·18\ d^2\sqrt{H\ \frac{T}{b+H}}.$$

In the volume given by this expression, the air is supposed to be of the same density as that of the interior of the reservoir from which it issues, and consequently to be under the pressure $b + \text{H}$. We may transform this volume into that which the same mass of air would occupy under a given pressure b' by multiplying the above value by the ratio $\frac{b+\text{H}}{b'}$ of the two pressures; moreover, we usually take the air under the atmospheric pressure supposed to be 2·4934 ft.; then $b' = 2{\cdot}4934$ feet, and we have

$$\text{Q} = \frac{948{\cdot}18}{b'} d^2 \sqrt{\text{H}\,(b+\text{H})\,\text{T}} = 380\, d^2 \sqrt{\text{H}\,(b+\text{H})\,\text{T}}.$$

510. If we wish to have the weight of the mass of air discharged in a unit of time, we multiply the first of the two values of Q just given by

$$\cdot 032533\, \frac{b+\text{H}}{1+\cdot 00222(t-32)},$$

the weight of a cubic foot of air under the pressure $b+\text{H}$, and at the temperature t (495), so that if P represents in pounds the weight sought, we shall have

$$\text{P} = 30{\cdot}787\, d^2 \sqrt{\text{H}\,\frac{b+\text{H}}{\text{T}}}.$$

511. In applications we usually adopt for b and t the mean values of the heights of barometer and of thermometer in the place of experiments.

If l is the latitude of the place, and e its approximate elevation above the level of the sea, we have

$$b = 2{\cdot}5 \text{ feet} - 0{\cdot}00009\, e, \qquad (433)$$
$$t = 82{\cdot}8 \cos l - \cdot 001981\, e - 0{\cdot}4.$$

We may also without any very serious error, cancel b and t of the formulæ, substituting for them a mean for a great extent of country; thus, for France, we would make $t = 53°6$ or $\text{T}' = 1{\cdot}048$, $b = 2{\cdot}46$ ft., and $b + \text{H} = 2{\cdot}559$ ft., and we shall have

$$\text{Q} = 621{\cdot}28\, d^2 \sqrt{\text{H}} \text{ cubic feet, and}$$
$$\text{P} = 48{\cdot}073\, d^2 \sqrt{\ } \text{ pounds.}$$

512. *General discharge for Gas.*—The principles which we have established, and the rules we have deduced for the flow of atmospheric air, apply to that of other aeriform fluids, with modifications depending upon the density of each.

Let there be, for example, a gas whose density in its ratio to that of the manometric fluid is d, and which issues from a reservoir, under a manometric pressure H. Its velocity of issue will be due to the height H, increased in the ratio of the density of mercury to that of the gas (500); and Q being the volume of the discharge per second of the latter, we shall have

$$\text{Q} = m\, \text{S} \sqrt{2\, g\, \frac{\text{H}}{d}}.$$

For another gas, of which d' is the density, and Q' the volume discharged, all else being equal, we shall have

$$\text{Q}' = m\, \text{S} \sqrt{2\, g\, \frac{\text{H}}{d'}}.$$

Thus,
$$\text{Q} : \text{Q}' :: \sqrt{\frac{1}{d}} : \sqrt{\frac{1}{d'}} :: \sqrt{d'} : \sqrt{d};$$

that is to say, *the volumes of two gases flowing through equal orifices, and under equal pressures, are in the inverse ratio of the square roots of their respective densities.*

Consequently, if atmospheric air is one of the gases, and p is the specific weight of the other (498), the ratio of the densities being that of 1 to p, the discharge of the last gas will be

$$\frac{380\ d^2}{\sqrt{p}}\sqrt{\mathrm{H}\ (b+\mathrm{H})\ \mathrm{T}}.$$

513. *Examples.*—Required the volume of atmospheric air reduced to a barometric pressure of 2·477 ft., which a reservoir will furnish, upon which the mercury-manometer stands at ·098 ft., and to which is fitted a nozzle ·246 ft. in diameter. It is in the 45th degree of latitude, and 656 ft. above the level of the sea.

In such a place we have as a mean (511) $b = 2{\cdot}44$ ft., and $t = 55{\cdot}4°$; according to the above data we also have $\mathrm{H} = {\cdot}098$ ft., $d = {\cdot}246$ ft., and $b' = 2{\cdot}477$; consequently, $\mathrm{T} = 1{\cdot}052$ and $b + \mathrm{H} = 2{\cdot}539$.

The volume of air discharged in 1 sec. will then be (509)

$$948{\cdot}18\ \frac{({\cdot}246)^2}{2{\cdot}477}\sqrt{{\cdot}098 \times 2{\cdot}539 \times 1{\cdot}052} = 11{\cdot}85.$$

Thus the reservoir will deliver 11·85 cub. ft. of air per second; such a quantity is sufficient to keep in action the fire of four or five large refining forges.

514. What should be the height of the mercury column in the manometer to cause a discharge through a nozzle ·19 ft. diameter of ·7 lbs. of atmospheric air in 1 sec.? The barometer as a mean stands at 2·46 ft., and the thermometer at 51·8°.

From the relation

$$\mathrm{P} = 30{\cdot}787\ d^2\sqrt{\mathrm{H}\ \frac{b+\mathrm{H}}{\mathrm{T}}};$$

by squaring and solving the equation of the second degree, we deduce

$$\mathrm{H} = -\tfrac{1}{2}\,b + \sqrt{\frac{\mathrm{P}^2\,\mathrm{T}}{(30{\cdot}787)^2\,d^4} + \tfrac{1}{4}\,b^2}.$$

Here we have $\mathrm{P} = {\cdot}7$ lbs., $b = 2{\cdot}46$ ft., $d = {\cdot}19$ ft., and $\mathrm{T} = 1{\cdot}044$. These quantities substituted in the above equation give $\mathrm{H} = 0{\cdot}158$; thus the required manometric height sought is ·158 ft.

If we had used the more simple formula (511)

$$\mathrm{P} = 48{\cdot}073\ d^2\sqrt{\mathrm{H}}$$

we should have

$$\mathrm{H} = \frac{{\cdot}7^2}{(48{\cdot}073)^2\ ({\cdot}19)^4} = 1627.$$

515. A gasometer discharges 9·8109 cub. ft. of illuminating gas per second, under a charge represented by a column of water ·147 ft.; required the size of the orifice to be made in the side of the gasometer to produce this flow. The barometer in this locality is usually at 2·477 feet, and the thermometer at 59°.

We have then $b = 2{\cdot}477$ ft., and $\mathrm{T} = 1{\cdot}06$; moreover $\mathrm{Q} = 9{\cdot}8109$ cub. ft. per second; and a manometric column of water of ·147 ft., is equivalent to one of mercury of

$$\frac{{\cdot}147}{13\,6} = {\cdot}010808\ \text{ft.} = \mathrm{H}.$$

The specific weight of illuminating gas (carburetted hydrogen) is, according to Berzelius and Dulong, $·559 = p$. The gasometer being made of copper sheets, the orifice will be made in a thin side, and the corresponding value of $m = 0{\cdot}65$.

The general equation (508 and 512)

$$\mathrm{Q} = \frac{1296\ m\ \mathrm{s}}{\sqrt{p}}\sqrt{\mathrm{H}\ \frac{\mathrm{T}}{b+\mathrm{H}}}$$

gives here

$$\mathrm{s} = \frac{9{\cdot}8109 \times \sqrt{{\cdot}559} \times \sqrt{2{\cdot}477 + {\cdot}010808}}{1296 \times {\cdot}65 \quad \times \sqrt{{\cdot}010808 + 1{\cdot}06}} = 1283.$$

Thus the required orifice will have a surface of 1283 sq. ft., or a square with its sides equal to ·358 ft., or if circular, ·403 ft. diameter.

(To be Continued.)

*Note on Steinbühl-yellow, a new kind of Chrome-yellow.**

By Dr. L. Pappenheim.

Under the above name a yellow color has been for some time in commerce which is quite certain to find much favor, although its price is far higher than that of the ordinary chrome-yellow. It is of a splendid yellow, and differs essentially in its tint from the best samples of chrome-yellow. It is pulverulent, of small specific gravity, loses nothing in weight at a red heat, but becomes transitorily reddish-brown, and is partially taken up by water without entirely dissolving in that fluid. It dissolves in muriatic and nitric acids; if the acid is poured over it in a concentrated state, a slight effervescence takes place.—When prepared with but little acid the solution is somewhat turbid, but does not leave any considerable portion when filtered. When heated with alcohol, the solution in muriatic acid becomes intensely dark-green; if more alcohol and then sulphuric acid be added, a white precipitate is produced. Solution of sulphate of lime does not precipitate the solution of the color in muriatic acid, but this is done by sulphuric acid with or without the addition of alcohol. The reddish-yellow color of the solution in nitric acid, changes by heating, with the addition of alcohol, into a beautiful blue. If acetate of lead be added to the dilute solution in nitric acid, a heavy precipitate of the color of chromate of lead makes its appearance. If an excess of lead were added, filtered, the excess of lead and the lime precipitated by sulphuric acid, alcohol added, filtered and evaporated, large quantities gave a residue, which, when dissolved in water and mixed with chloride of platinum with the addition of muriatic acid, furnished octahedra of platinochloride of potassium. The investigation gave no magnesia or other bases except lime and potash. Of acids, besides the chromic acid, which was undoubtedly present from the preceding experiments, there was only a small quantity of sulphuric acid.

When the author mixed a hot saturated solution of bichromate of potash with a saturated solution of chloride of calcium, a precipitate was produced, which, when washed and dried, was undistinguishable from the Steinbühl-yellow.

The substance gave 3·1 per cent. to distilled water after short stirring. With nitrate of silver, the yellow filtrate gave a red precipitate of chromate of silver, which was rapidly converted into white chloride of silver on the addition of a few drops of muriatic acid. Sulphuric acid and alcohol produce a strong turbidity in the filtrate. When boiled with reducing organic matters and muriatic acid, the yellow filtrate loses its color, without, however, acquiring more than a tinge of green. Acetate of lead precipitates the yellow filtrate, with the color of chromate of lead. Chloride of platinum produces a very slight turbidity in the original filtrate. Even in 16 hours no precipitate is deposited.

The Steinbühl-yellow consists, therefore, of chromic acid, lime, and potash; when stirred for a short time with cold water, it parts with chromate of lime.

* From the Lond. Chemical Gazette, No. 409.

The poisonous qualities of chromic acid and its soluble salts, and the circumstances that the color parts with perceptible, although not large quantities of chromic acid to cold water, render the Steinbühl-yellow an extremely dangerous coloring matter, the employment of which in confectionery and similar trades must not be thought of.—*Monatsblatt des Gewerbe-Vereins zu Köln*, May, 1859; *Polytechnic Centralblatt*, 1859, p. 973.

For the Journal of the Franklin Institute.

Particulars of the Steamer Seth Grosvenor.

Hull built by Henry Steers. Machinery by Allaire Works, New York. Superintended by Charles H. Haswell. Intended service, Coast of Africa. Built by the New York State Colonization Society, to run from Monrovia to Cape Mount.

HULL.—

Length on deck,	95 feet.
Breadth of beam, molded,	16 " 10 inches.
Frames—7 ins. by 3 ins., and 16 ins. apart from centres.	
Bulkheads—one.	
Keel,	4 ins.
Depth of hold to spar deck,	5 "
Length of engine space,	27 by 6 ft.
Draft of water,	3 "
Tonnage,	68.
Area of immersed section at load draft of 3 ft.,	39 sq. ft.
Masts—two. Rig—Schooner.	

ENGINE.—Steeple.

Diameter of cylinder,	28 inches
Length of stroke,	3 feet.

BOILER.—One—Return tubular.

Length of boiler,	12 feet 6 inches
Breadth "	5 " 9 "
Height " exclusive of steam chests,	6 " 10 "
Number of furnaces,	one.
Breadth "	5 "
Length of grate bars,	4 " 6 "
Area of grate surface,	22·5 sq. ft.
Number of tubes,	36.
Internal diameter of tubes,	30 of 4 ins. and 6 of 3 ins.
Length of tubes,	9 "
Lower flues,	4.
Diameter of flues,	2 of 8 ins. and 2 of 15 ins.
Area of flues,	453 sq. ins.
" tubes,	367 "
" chimney,	530 "
Heating surface,	540 sq. ft.
Diameter of steam chimney,	2 " 2 "
Height "	5 "
Diameter of smoke pipe,	28 "
Height "	24 "
Consumption of coal per day,	2 tons.

PADDLE WHEELS.—

Diameter, over boards,	13 feet 6 inches.
Length of blades,	3 "
Depth "	15 "
Number "	14.

Remarks.—One independent steam, fire, and bilge pump. C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steamer New London.

Hull built by Geo. Greenman & Co., Mystick Corner. Machinery by C. H. Delamater, New York. Owners, New London Propeller Co.

HULL.—

Length on deck,	135	feet.
Breadth of beam, molded,	26	"
Frames—molded, 12 ins.—sided, 8 and 9 ins.—apart at centres, 24 ins.		
Depth of hold,	8 feet	6 inches.
Draft of water, forward, 8 feet, aft,	10	"
Tonnage, 260.		
Masts, three—Rig, schooner.		

ENGINES.—Vertical direct.

Diameter of cylinder,		34 inches.
Length of stroke,	2 feet	6 "
Cut-off—one-third.		

BOILER.—One—Return tubular.

Length of boiler,	18 feet.	
Breadth "	8 "	8 inches.
Height " exclusive of steam chimney,	8 "	8 "
Number of furnaces, 2.		
Breadth "	3 "	3 "
Length of grate bars,	7 "	
Number of flues, above, 16—below, 10.		
Internal diameter of flues, above,		8 "
Internal diameter of flues, below, 8 of 9½ inches, and 2 of		16 "
Length of flues, above,	12 "	10 "
Length of flues, below,	9 "	8 "
Diameter of smoke pipe,	3 "	

PROPELLER.—

Diameter of screw,	9 feet.	
Length "	1 "	6 inches.
Pitch "	17 "	
Number of blades, 4.		

Remarks.—One independent steam, fire, and bilge pump. Date of trial, November, 1859. C. H. H.

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*Resistance to Shot of Iron and Steel Plates.**

A series of experimental trials have been carried on during the past month at Portsmouth, with a view of ascertaining the amount of resistance offered by iron and steel plates of various manufactures when opposed to heavy ordnance at a short range. The trials had reference to the future coating of the steam ram now in progress of construction. The practice has been carried on from the *Stork* gunboat, tender to Her Majesty's ship *Excellent*, gunnery ship in Portsmouth harbor, both from a 32 pounder and a 95 cwt. gun, the latter throwing a solid 68 lb. shot, with 16 lb. charge of powder; the distance of range 200 yards. At this distance the results of the experiments have demonstrated that no iron or steel plate that has yet been manufactured can withstand the solid shot from the 95 cwt. at a short range. The first shot would not penetrate through the iron plate, but it would fracture

* From the Lond. Civ. Eng. and Arch. Journal. Sept., 1859.

it, and on three or four striking the plate in the same place, or in the immediate neighborhood, it would be smashed to pieces. As the results of the trial affected the steel plates, it proved that a steel-clothed ship could be far more easily destroyed than a wooden-sided one, and that on the smashing in of one of the steel plates the destruction of life on the armed ship's decks, supposing the broken plate to be driven through the ship's side, would be terrible, from the spread of the splintered material. At from 600 to 800 yards iron-clothed ships would be in comparative safety from the effects of an enemy's broadside, but the effects of concentrated firing have yet to be ascertained on the sides of an iron or steel-clothed ship, and account also must be taken of the damage the wood-work forming the inner sides of such a ship would receive from the driving in of the broken plates, and which, as far as the present experiments have illustrated, would appear to prove that an iron or steel-clad ship, on receiving a concentrated broadside from a frigate, armed in a similar manner to the *Mersey*, and struck near her water-line, must sink then and there, with her armor on her back.

For the Journal of the Franklin Institute.

Particulars of the Steamer Florida.

Hull built by E. S. Whitlock. Machinery by C. H. Delamater, New York. Owners, O. Nelson & Co.

HULL.—

Length on deck,		180 feet.
Breadth of beam (molded),		31 "
Frames—molded, 12 ins.—sided 14 ins.—apart at centres, 26 ins.		
Depth of hold,		9 "
" to spar deck,		16 "
Draft of water,	forward, 9 feet 6 ins.—aft,	10 "
Tonnage,	300.	
Masts, two—Rig, schooner.		

ENGINE.—Vertical direct.

Diameter of cylinder,		36 inches.
Length of stroke,	3 feet	6 "
Cut-off—one-third.		

BOILER.—One—Return flue.

Length of boiler,	24 feet.	
Breadth "	10 "	6 inches.
Height " exclusive of steam chimney,	11 "	10 "
Number of furnaces,	2.	
Breadth "	4 "	6 "
Length of grate bars,	7 "	6 "
Number of flues, above, 20—below, 10.		
Internal diameter of flues, above,		6 "
Internal diameter of flues, below, 8 of 13½ ins., 2 of		20 "
Length of flues, above, 16 ft. 2 ins.—below,	10 "	8 "
Diameter of smoke pipe,	3 "	11 "

PROPELLER.—

Diameter of screw,	10 feet.	
Length "	3 "	6 inches.
Pitch "	18 "	
Number of blades,	4.	

Remarks.—One independent steam, fire, and bilge pump. Date of trial, October, 1859. C. H. H.

For the Journal of the Franklin Institute.

Particulars of the Steamer Daylight.

Hull built by Samuel Sneden. Machinery by C. H. Delamater, New York. Intended service, New York to Providence.

HULL.—

Length on deck,	170	feet.	
Breadth of beam,	29	"	8 inches.
Frames—molded, 14 ins.—sided, 8 ins.—apart from centres, 24 ins.			
Depth of hold to spar deck,	10	"	
Draft of water, forward, 11 feet, aft,	13	"	
Tonnage, 460.			
Area of immersed section at load draft of 12 ft., 300 sq. ft.			
Masts, three. Rig, schooner.			

ENGINES.—Vibrating lever (Ericsson's).

Diameter of cylinder,			40 inches.
Length of stroke,	2	feet.	

BOILERS.—Two—Horizontal tubular.

Length of boilers,	18	feet.	
Breadth "	7	"	6 inches.
Height " exclusive of steam chimney,	7	"	6 "
Number of furnaces, one each.			
Breadth "	4	"	4 "
Length of grate bars,	6	"	3 "
Number of tubes, above, 63.			
" flues, below, 6.			
Internal diameter of tubes, above,			4 "
" flues, below,	1	"	2 "
Length of tubes, above,	14	"	10 "
" flues, below,	8	"	2 "
Heating surface, 2600 sq. ft.			
Diameter of smoke pipes,	3	"	
Height "	30	"	

PROPELLERS.—

Diameter of screw,	11	feet	4 inches.
Length "	2	"	
Pitch "	19	"	
Number of blades, 4.			

Remarks.—One independent steam, fire, and bilge pump. Date of trial, November, 1859. C. H. H.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, January 19, 1860.

John C. Cresson, President, in the chair.

John Agnew, Vice-President.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

A letter was read from G. Rush Smith, Esq., Pennsylvania Legislature, Harrisburgh, Penna.

Donations to the Library were received from the Royal Society, the Zoological Society, the Institute of Actuaries, and P. Lutley Sclater, Esq., London; the Royal Cornwall Polytechnic Society, Falmouth, and

the Literary and Philosophical Society, Liverpool, England; the Oesterreichischen Ingeniuer-Verienes, and the Geologischen Reichsanstalt, Wien, Austria; L. A. Huguet-Latour, Esq., Montreal, Canada; the N. O. School of Medicine, New Orleans, La.; the Cooper Union for the Advancement of Science and Art, City of New York; Messrs. A. B. and E. Latta, Cincinnati, Ohio; G. Rush Smith, Esq., Pennsylvania Legislature, Harrisburgh, Pa.; and from the American Philosophical Society, and Professors B. Howard Rand, John C. Cresson, and John F. Frazer, Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer's statement of the receipts and payments for the month of December, and his annual statement for 1859, were read.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (10) were proposed, and the candidates proposed at the last meeting (9) were duly elected.

John M. Gries, Esq., from the Board of Managers, read the report made to the Board at their last meeting by a special committee appointed by them, to inquire into and report on the financial state of the Institute.

On motion, the report was referred to the new Board of Managers, elected this evening, with a request that they take an early action on it.

The Tellers of the Annual Election for Officers, Managers, and Auditors, for the ensuing year, reported the result, when the President declared the following gentlemen duly elected:—

John C. Cresson, President.

John Agnew, Matthias W. Baldwin, } Vice Presidents.

Isaac B. Garrigues, Recording Secretary.

Frederick Fraley, Corresponding Secretary.

John F. Frazer, Treasurer.

MANAGERS.

Samuel V. Merrick,	Thomas J. Weygandt,	James Dougherty,
Thomas Fletcher,	Joseph J. Barras,	George Whitney,
Edwin Greble,	George Erety,	Edward P. Eastwick,
Thomas S. Stewart,	Evans Rogers,	Washington Jones,
Alan Wood,	Robert Cornelius,	William Harris,
John E. Addicks,	William Sellers,	John E. Wootten,
Isaac S. Williams,	James H. Bryson,	Joseph Hutchinson,
George W. Conarroe,	John M. Gries,	Joseph W. Moore.

AUDITORS.

Samuel Mason, James H. Cresson, Samuel B. Finch.

At a meeting of the Board of Managers, held January 19th, 1860, the following officers were elected for the ensuing year.—

William Sellers, Chairman.

Isaac S. Williams, James H. Bryson, } Curators.

J. Daniels, of No. 805 Market Street, exhibited his Plantarium or

plant case, which is claimed to possess advantages over the Waltonian case, as:—Facility of access from the top or the back, giving the operator a better chance to handle and arrange the plants, or to remove the tray. It is so made as to be increased in capacity if required. The top is formed of glass plates, which can be moved so as to give an opening at the apex for the escape of moisture, should it be in excess. The heating apparatus is a galvanized iron tank containing water, under which the alcohol lamp is placed. By filling the tank with hot water, morning and evening, the lamp may be entirely dispensed with.

The Skaters' Club of the City of Philadelphia, sent for the inspection of the meeting, samples of the skates manufactured in this city, as well as one imported from Prussia. One pair, by W. Bushnell, of beautiful appearance and finish, was exhibited at the Paris Exhibition and obtained the award. Another, by Clarenbach & Herder, not so ornamental, but equally well finished and proportioned, with others of lighter make, intended for female use, were in the lot. Also, a skating boot with a sock over it, intended to keep the foot warm. All the skates of American make, had a simple and efficient way of securing the heel of the skate to the foot. A T shaped piece projects from the centre of the heel of the skate, which, by placing the skate at right angles to the foot, can be passed through an oval hole cut through a metal plate which is secured to the heel of the boot; then, by turning the skate until its direction coincides with that of the foot, the shoulders of the piece catch under the plate and clamp the two together, securing the part most liable to get loose when fastened in the ordinary way by straps and buckles.

A. C. Jones, in bringing before the meeting his "self-tightening joint," stated that with the exception of metallic surfaces, all joints in use depended on the ridged end-surfaces of the pipes compressing the interposed material, by screw bolts or other mechanical means; and, as is well known, such joints usually become leaky or "blown out." In long lines of steam pipe, such as may be seen in factories and stern-wheel steamboats, when the supports of the pipe yield by settling, the joints either leak, or the pipe becomes fractured, and loss of lives has resulted from the sudden escape of steam; also detention and expense to repair. In introducing the self-tightening principle, the patent will cover a new and large field, and supplies a want long felt for a joint which is unlimited in size and pressure, has a limited amount of movement at the connexion without impairing its tightness, and can be quickly connected or disconnected.

A steam-pipe joint (or any other) can be made cheaper and neater than the flanched one, and, for long lines, it dispenses with the use of stuffing-boxes, and avoids the strain from expansion and contraction, so injurious to other joints. If the pipes get out of line, they will be neither fractured nor leak, and may be adjusted simply by raising the pipe in line.

In the "union" or screw coupling, the constant tightening compresses the lead or elastic material so much, as in time, to reduce the passage to a small size; with the self-tightening joint, the bore remains the same, and the joint continues tight without the use of a wrench.

In laying water pipe in the street, the operation is tedious and very expensive; and, if a heavy rain sets in before the joints are run, the work has to be done over again, leaving open trenches to the detriment of the public.

If a branch is to be inserted, the main pipe has to be cut in two places, a slow operation in a trench.

With the self-tightening joint, a narrower trench will suffice, and the pipes can be laid in wet or dry weather, nearly as fast as they can be handled and placed in line; if a branch is to be put in, two contiguous pipes can be removed without injury (to be used again), and the branch speedily inserted.

The fire-hose coupling shown is self-acting; it locks itself simply by pressing the male into the female, making a safe union, and the water pressure makes its own joint; it is uncoupled without any tools, by a finger and thumb raising one pawl or clamp.

It was intended, if the weather had been cold enough, to show this coupling to the meeting in a frozen state, to prove the ease with which it could be opened when there was solid ice inside and around it, a test which it has been submitted to many times without injury during the coldest weather; and uncoupled in the open air, with one finger and thumb, without tools of any kind except a small block of wood to break the mass of ice.

Its rounding form (independent of its compressive strength) would prevent any road wheels remaining on it for an instant, to crush it. Its whole surface is smooth, presenting no sharp angles to injure hose in contact with it. It will pass through a smaller hole than a screw coupling of the same bore.

The male of one coupling has been dragged at a fast trot behind a City passenger car (twice) for four squares, bumping over the cobble stones, and its appearance shows the hard usage it has been subjected to; yet it is water-tight and serviceable yet. This is a test which no other plan of coupling could endure without being ruined. It has been submitted to the ordeals of pressure, mud, falls, &c., and the result is that it has wearing qualities which cannot be exceeded.

A fire occurring in the upper part of a factory, owing to the operatives not understanding how to connect the screw couplings of the hose, got so much headway that $75,000 worth of property was destroyed; children, under the age of five years, after a few minutes instruction, have coupled a larger sized hose coupling than is necessary for buildings. The tremor on railroads will loosen any form of screw coupling after it has been a short time in use, and sometimes a loss of water in the tank is the consequence. The improved self-acting coupling incurs no risk of this kind, and is more quickly connected or disconnected.

All are familiar with the perplexity of servants in coupling and uncoupling the wash-pave hose, and the leaky joints from the loss of the washers, or injury to the end of the male; the improved coupling has no loose parts to get lost or to be injured by the usual wear. Their cost will be about the same as the screw. The inventor, after many experiments, brings forward this new joint, and it will be still further tested by a Committee of the Institute.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on R. H. Long's Salinometer Case.

The Committee on Science and the Arts constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination—"An Improved Marine Salinometer Case for Steam Boilers," invented by R. H. Long, of Philadelphia, Pennsylvania,

REPORT:—That the ordinary Salinometer Case, consists simply of a tube communicating with the boiler, and containing the hydrometer —the communication with the boiler being made by means of a pipe which passes from the bottom of the case to below the lowest water-level of the boiler, and provided with a stop-cock, which, when turned, permits the pressure of steam in the boiler to force the water up in the case, and float the hydrometer. But the ebullition in the case, produced by the escape of the steam under a reduced pressure, throws a great deal of hot water out of the instrument, and subjects the observer to the danger of being scalded, and at the same time causes such violent oscillations as to risk the safety of the hydrometer, and prevent its being read until the stop-cock is closed, when very frequently there will not be found enough water in the instrument to float the hydrometer.—The annoyances and tediousness of the instrument as ordinarily constructed, therefore, offer strong inducements to the persons charged with the care of the engine, to neglect the duty of reading it. The improvement of Mr. Long (which is well shown in the appended description) consists in adding to the ordinary Salinometer Case another tube connected with it at the bottom. This supply-tube is connected with the boiler by means of a pipe which passes from below the water-line of the boiler through the bottom and along the axis of the supply-tube to a point near its top, where it opens into the supply-tube by means of a number of vertical slits. The main tube, in which the hydrometer floats, is not connected with the boiler, but has a waste-pipe by which any escape of water may be carried off; and proper supports for a thermometer.

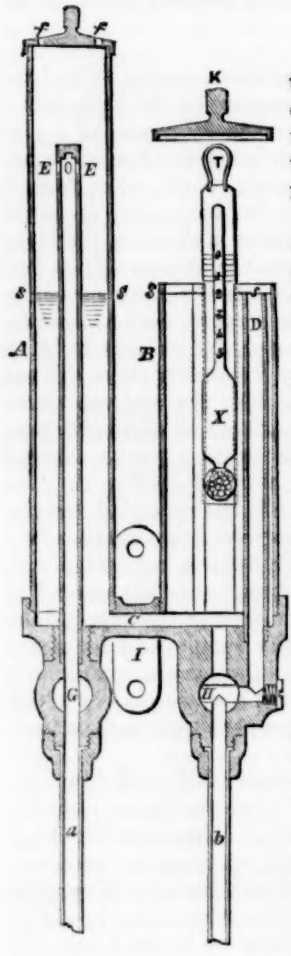
Now when, by turning the stop-cock, the water is forced from the boiler into the supply tube, it is thrown, not upwards, but against the side of the tube, owing to the mode of its escape. The steam which accompanies it, is separated and escapes through openings in the cover, and the water falling to the bottom passes through the tube of communication and rises to the same level in the Salinometer tube, in which, the hydrometer floats tranquilly, and may therefore be read speedily and accurately. By means of the waste-pipe, a current may be kept passing through the instrument, which is thus always in action, and may be read by the engineer at a glance, as he passes in the performance of his other duties.

The Committee believe the modification thus proposed, to be a simple and effective mode of inducing a more general and punctual use of

this valuable gauge, which ought not to be neglected on any boilers using salt water; and they therefore commend it to the notice of all engaged in the manufacture and management of such boilers.

By order of the Committee,

Philadelphia, January 12, 1860. WM. HAMILTON, *Actuary.*



Description by the Inventor.

This improvement consists in attaching the cylinder A to the cylinder B, having a communication C, as a means of safety to the hydrometer, perfect accuracy in testing the density of water, and insuring the engineer against danger from scalding, &c.

The cylinder or other shaped vessel A, is connected with the boiler by the pipe and stop-cock G, the pipe G being closed at the top and having openings on the side near the top, E E.

The water coming from the boiler and passing the stop-cock G, makes its exit through the openings E E: at this point the steam is liberated from the water and escapes through the openings f f. The water falls into the cylinder A, passes through the opening C, and rises to the water level s s s s in both cylinders; D is an overflow pipe to carry off the surplus water, and to keep up a sufficient current to maintain the water to be tested, at the required temperature. By turning the stop-cock H, both cylinders can be discharged. T is a thermometer fitting in a slide. X is the hydrometer. K is the cover for closing the case when not in use. I is a bracket for securing the instrument to the boiler, bulkhead, or other suitable place.

This instrument affords a ready means of drawing water from a steam boiler under any pressure and temperature, without ebullition in the cylinder B or oscillation to the hydrometer.

The Scientific American.

Hon. Judge Mason, of Iowa, who made himself so popular with the inventors of the country while he held the office of Commissioner of Patents, has, we learn, associated himself with Munn & Co., at the *Scientific American* Office, New York.

Abstract of Meteorological Observations for November, 1859, made in Philadelphia, Adams, and Somerset Counties,

Abstract of Meteorological Observations for November, 1859; made in Philadelphia, Adams, and Somerset Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

1859.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.									GETTYSBURG, Adams Co. Lat. 39° 49′ N. Long. 77° 18′ W. Height 624 feet. Prof. M. JACOBS, Obs.						SOMERSET, Somerset Co. Lat. 40° N. Long. 79° 3′ W. Height 2195 feet. GEO. MOWRY, Observer.							
	Barometer.		Thermometer.			Force of vapor.	Relative humidity.	Rain and Snow.	Prevail'g winds.	Barometer.		Thermom.		Rain and Snow.	Prevail'g. winds	Barometer.		Thermom.		Force of vapor.	Relative humidity.	Rain and Snow.	Prevail'g winds.
Nov.	Mean.	Mean daily range.	Mean.	Daily oscillation.	Mean daily range.	2 P.M.	2 P.M.			Mean.	Mean daily range.	Mean.	Mean daily range.			Mean.	Mean daily range.	Mean.	Mean daily range.	2 P.M.	2 P.M.		
	Inch.	Inch.	°	°	°	Inch.	Per ct.	Inches.	Direc.	Inch.	Inch.	°	°	Inch.	Direc.	Inch.	Inch.	°	°	Inch.	Per ct.	Inch.	Direc.
1	30·017	·031	43·0	19	1·3	·129	37		(var.)	29·705	·009	33·8	3·7		S W.	27·771	·037	34·3	0·3	·191	61		?
☽ 2	29·976	·035	43·7	23½	2·0	·170	42		WSW.	29·650	·070	38·3	4·5		S W.	27·788	·043	37·0	2·7	·188	56		W.
3	30·247	·271	45·7	20	2·0	·180	43		W.	29·913	·263	40·0	1·7		N W.	27·978	·190	42·0	5·0	·242	56		W.
4	30·147	·121	51·7	24	6·0	·255	46		S W.	29·801	·112	46·0	6·0		S W.	27·916	·062	50·7	12·0	·397	56		S W.
5	30·031	·126	50·2	26	4·5	.333	49		S W.	29·677	·124	54·0	8·0		S W.	27·834	·049	59·3	6·0	·348	51		W.
6	30·232	·211	48·8	18	7·3	·147	32		N E.	29·923	·249	44·7	9·3		N E.	27·986	·119	48·3	11·0	·209	44		E.
7	30·295	·063	48·0	21	2·5	·202	42		N E.	29·970	·047	42·0	4·0		(var.)	27·972	·024	42·7	5·7	·216	61		S E.
8	30·178	·117	52·8	18	4·8	·309	60		N E.	29·872	·098	46·7	5·3		N E.	27·875	·097	50·3	7·7	·296	55		S.
9	29·985	·194	52·8	18	2·7	·380	76		N E.	29·612	·260	53·3	6·0		S W.	27·692	·183	55·0	4·7	·393	59		S E.
○ 10	29·634	·350	58·5	12	5·7	·473	88	0·025	S.	29·187	·425	58·3	5·0		S.	27·371	·321	52·0	3·0	·367	71	0·009	W.
11	29·785	·197	48·2	21	10·3	·170	42		N W.	29·443	·256	43·0	15·3		N W.	27·575	·204	40·7	11·3	·204	68		(var.)
12	29·806	·179	51·7	24	9·8	·327	74		S E.	29·367	·163	42·7	5·0	0·110	S E.	27·376	·199	53·7	13·0	·295	59	0·017	S.
13	29·532	·274	44·8	31	20·5	·226	83	0·868	N W.	29·145	·279	38·0	16·7		(var.)	27·367	·117	24·0	29·7	·074	60	0·151	W.
14	29·951	·419	33·7	13	12·5	·123	54		(var.)	29·579	·469	29·0	13·7		(var.)	27·673	·305	28·3	15·7	·134	69		W.
15	30·131	·180	40·3	20	6·7	·142	42		N E.	29·719	·137	31·3	5·7		(var.)	27·792	·119	34·0	9·0	·225	79		S W.
16	30·208	·077	45·3	23	5·0	·242	56		N E.	29·841	·092	35·7	4·3		S W.	27·861	·072	45·3	4·7	·183	47		S.
☾ 17	30·167	·040	51·0	22	5·7	·351	70	0·015	N E.	29·804	·037	47·7	12·0		S W.	27·848	·013	47·3	8·7	·295	59		S.
18	29·856	·312	56·7	14	5·7	·487	94	1·285	N E.	29·439	·365	52·0	7·7	0·280	N E.	27·583	·206	52·0	9·3	·334	86	0·253	E.
19	29·513	·343	61·0	12	6·7	·385	67		S W.	29·051	·388	56·7	8·0		(var.)	27·272	·316	45·0	7·0	·262	84	0·146	WSW.
20	29·913	·400	46·2	18	14·8	·183	47		WSW.	29·597	·545	41·7	15·0		N W.	27·730	·458	36·0	9·0	·142	51		(var.)
21	30·090	·216	40·0	14	8·8	·190	74	1·578	N E.	29·720	·226	35·3	6·3	0·790	(var.)	27·692	·082	36·0	6·7	·176	85	0·626	S E.
22	29·804	·287	52·2	16	12·2	·308	64		W.	29·449	·269	46·7	11·3		S W.	27·589	·120	46·0	10·0	·244	60		W.
23	29·949	·146	47·3	11	4·8	·172	46		W.	29·627	·167	44·3	3·0		N W.	27 817	·228	38·0	8·0	·152	64		W.
● 24	30·201	·252	36·0	15	11·3	·130	55		N W.	29·868	·251	37·0	7·3		(var.)	27·951	·134	34·3	5·0	·153	61		N W.
25	30·143	·095	36·8	13	4·2	·138	56	0 017	(var.)	29·732	·109	31·0	8·0	0·015	S.	27·698	·253	33·7	5·3	·147	78	0·056	S.
26	29·681	·462	54·2	27½	17·3	·342	57		W.	29·290	·442	50·3	19·3		N W.	27·490	·239	46·3	12·7	·219	54		W.
27	29·785	·105	45·5	11	8·7	·140	40		W.	29·366	·136	41·3	9·3		N E.	27·525	·085	37·0	9·3	·179	64		W.
28	29·804	·080	43·0	13	3·2	·162	45		W N W	29·420	·102	38·0	3·3		(var.)	27·561	·084	33·7	3·3	·155	58		W.
29	29·973	·169	40·0	16	3·0	·146	47		W.	29·578	·156	36·3	1·7		S W.	27·684	·123	33·0	5·3	·172	60		S W.
30	29 932	·041	49·7	21½	9·7	·281	63	0·008	S W.	29·553	·039	37·7	2·0		(var.)	27·657	·027	51·3	18·3	·281	58		WSW.
Means	29·965	·193	47·5	18¼	7·3	·241	56	3·796	N55°W.	29·597	·211	42·4	7·6	1·195	S78°W.	27·697	·152	42·2	8·6	·229	62	1·258	S44°W.